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FIG. 1a

SUB-NANOPOROUS ZEOLITES : < 1nm

FAUJASITE 

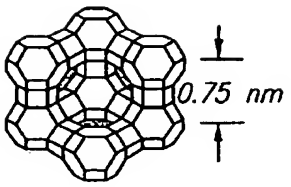
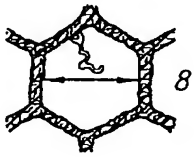


FIG. 1b

FIG. 1c

MESOPOROUS MOLECULAR SIEVES: 2- 10 nm

MCM-41  8 nm

ULTRA LARGE PORE MATERIALS 5 - 50 nm

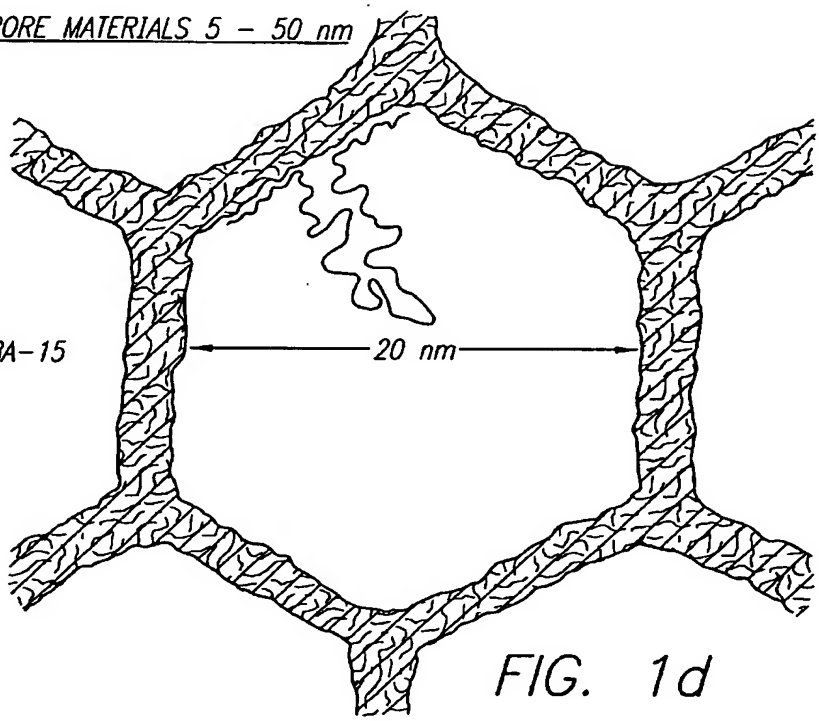


FIG. 1d

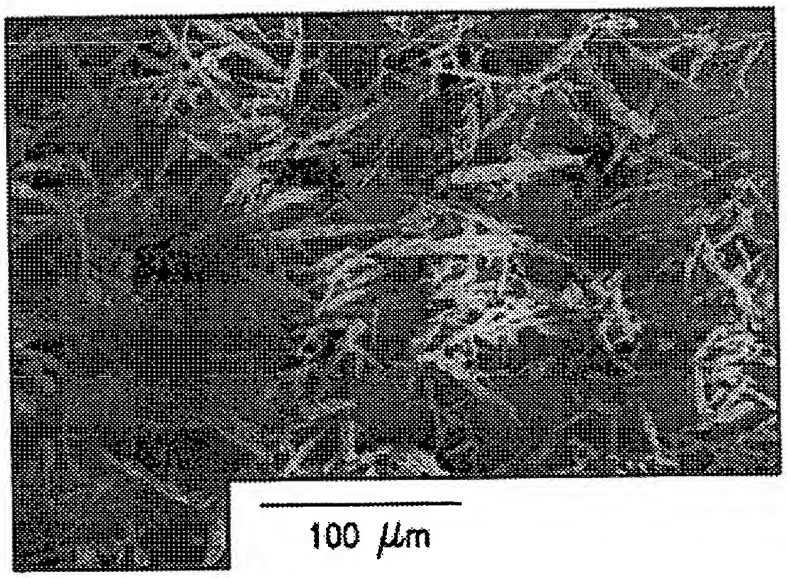


FIG. 3a

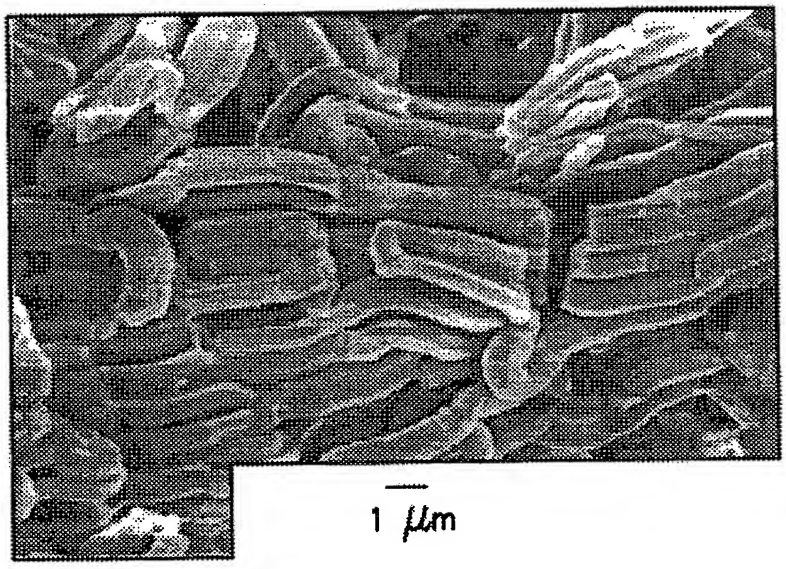


FIG. 3b

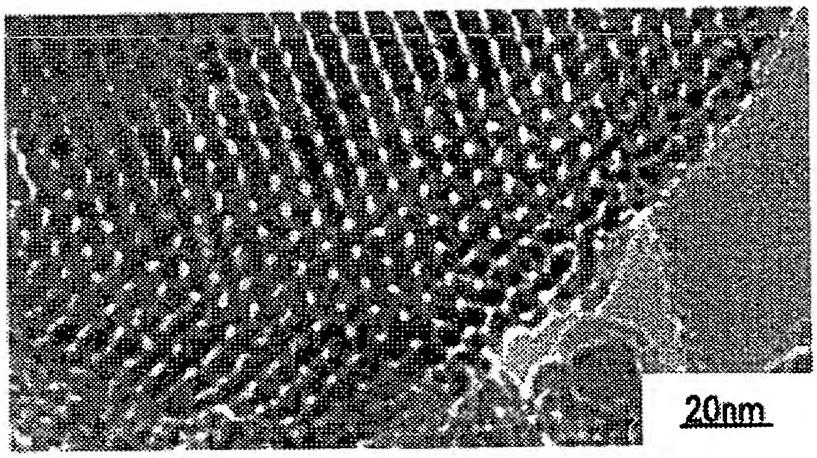


FIG. 3c

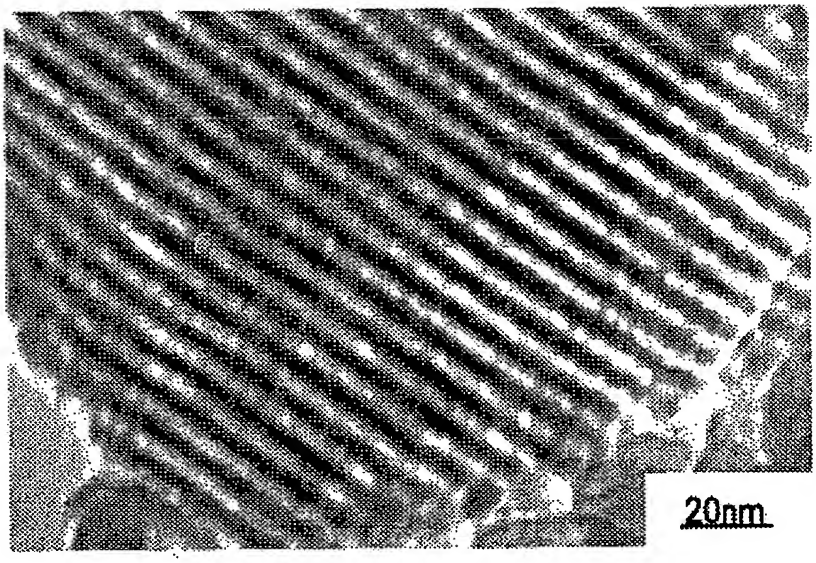


FIG. 3d

FIG. 4a

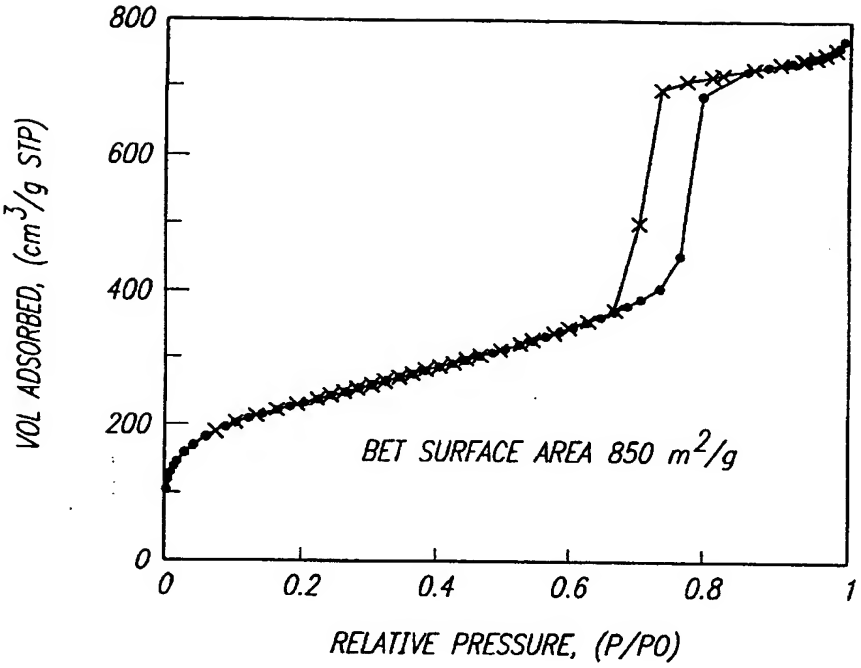

800
600
400
200
0
VOL ADSORBED, (cm3/g STP)
BET SURFACE AREA 850 m2/g
0
0.2
0.4
0.6
0.8
1
RELATIVE PRESSURE, (P/PO)

FIG. 4b

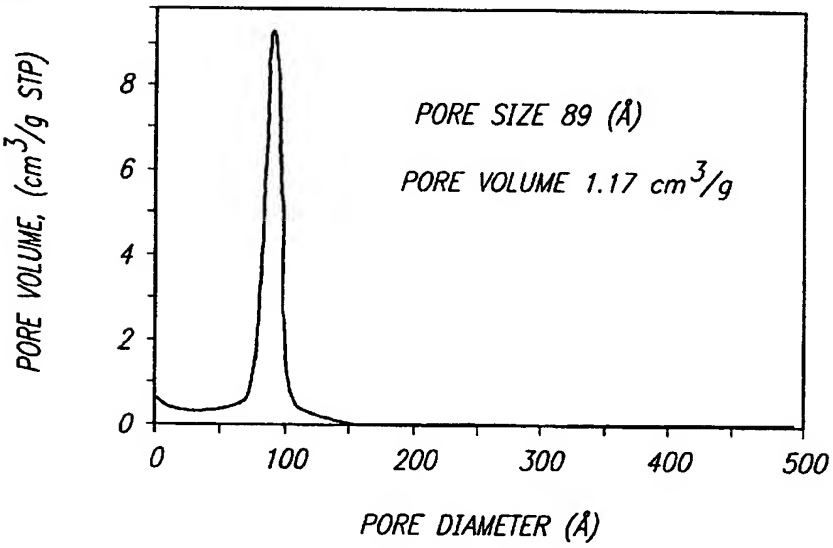

8
6
4
2
0
PORE VOLUME, (cm3/g STP)
PORE SIZE 89 (Å)
PORE VOLUME 1.17 cm3/g
0
100
200
300
400
500
PORE DIAMETER (Å)

FIG. 4c

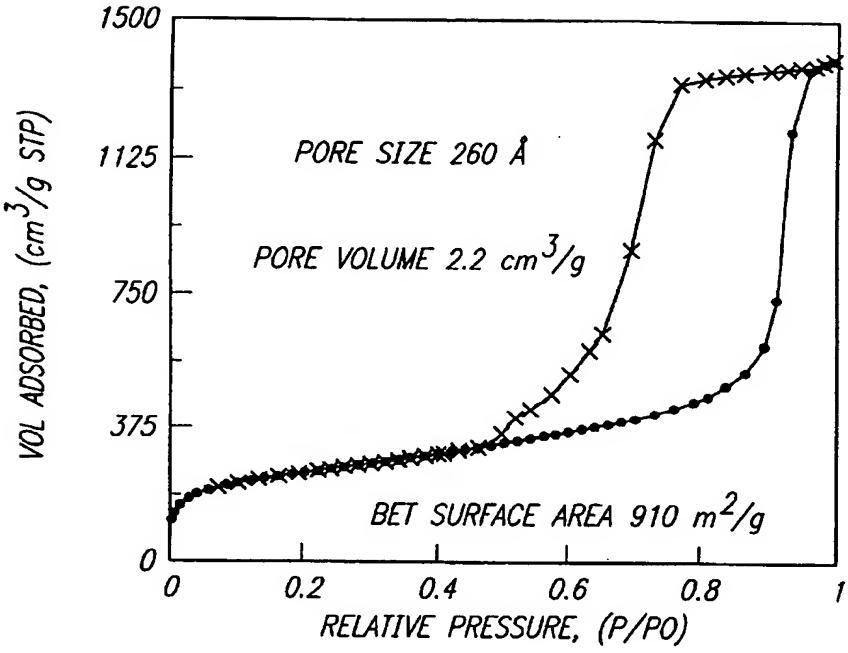

1500
1125
750
375
0
VOL ADSORBED, (cm3/g STP)
PORE SIZE 260 Å
PORE VOLUME 2.2 cm3/g
BET SURFACE AREA 910 m2/g
0
0.2
0.4
0.6
0.8
1
RELATIVE PRESSURE, (P/PO)

FIG. 4d

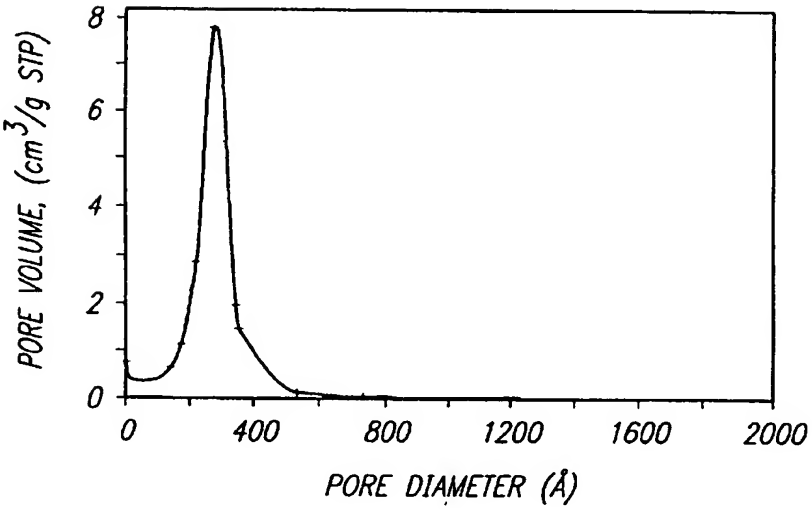

8
6
4
2
0
PORE VOLUME, (cm3/g STP)
0
400
800
1200
1600
2000
PORE DIAMETER (Å)

FIG. 5a

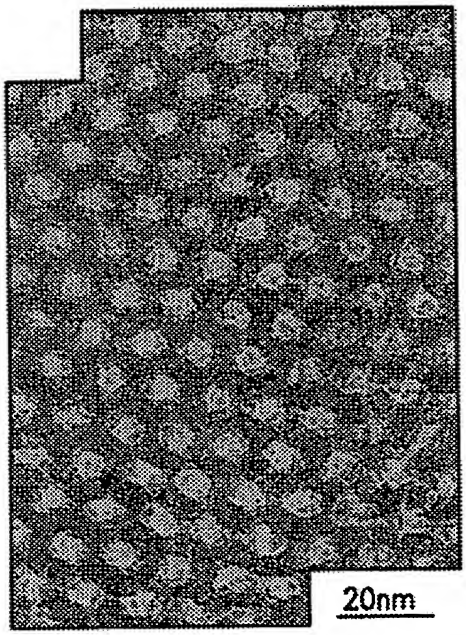


FIG. 5b

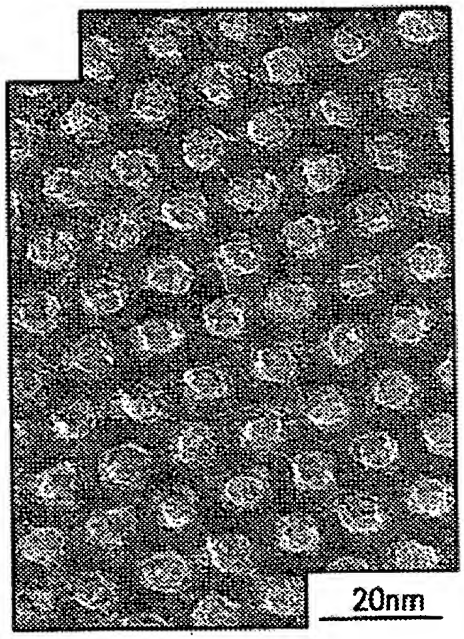


FIG. 5c

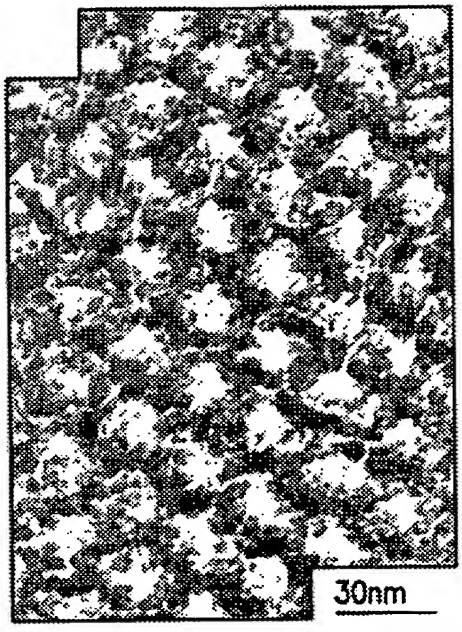
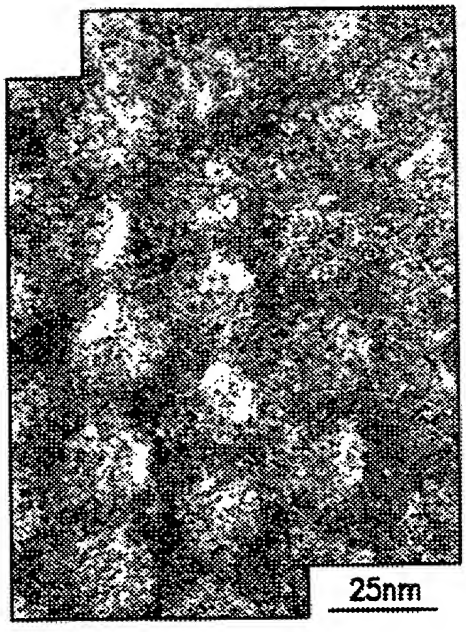


FIG. 5d



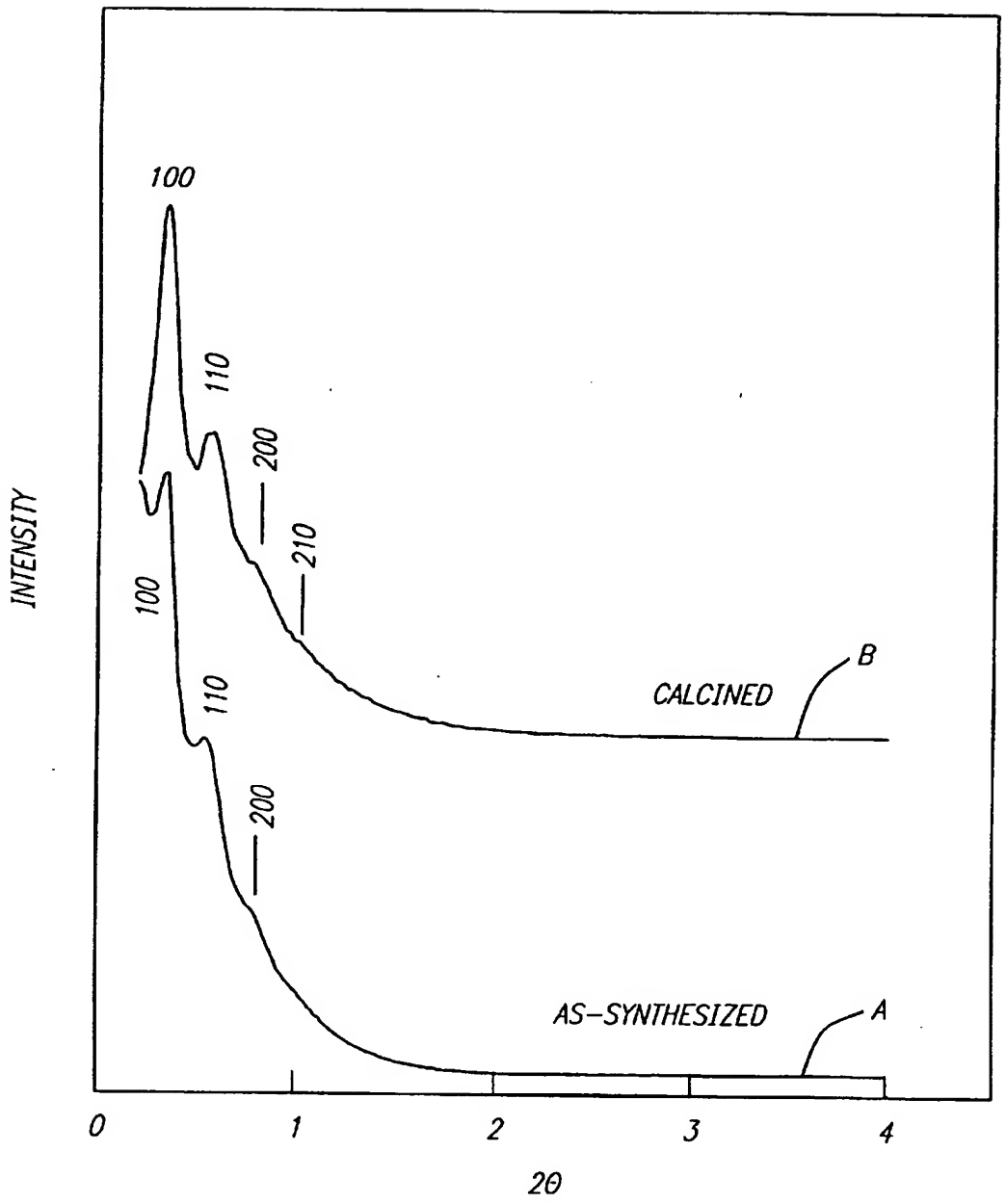
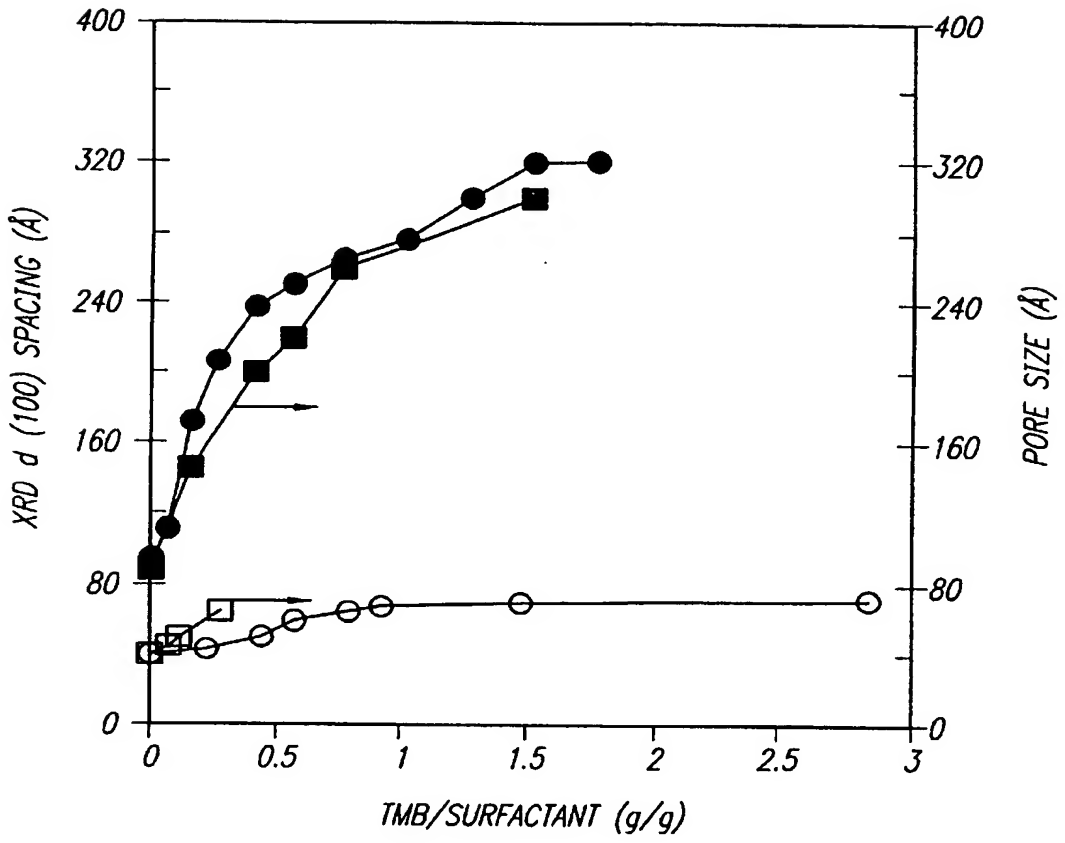

INTENSITY
100
110
200
210
CALCINED
B
100
110
200
AS–SYNTHESIZED
A
0
1
2
3
4
2θ

FIG. 6

FIG. 7


400
320
240
160
80
0
XRD d (100) SPACING (Å)
0
0.5
1
1.5
2
2.5
3
TMB/SURFACTANT (g/g)
PORE SIZE (Å)

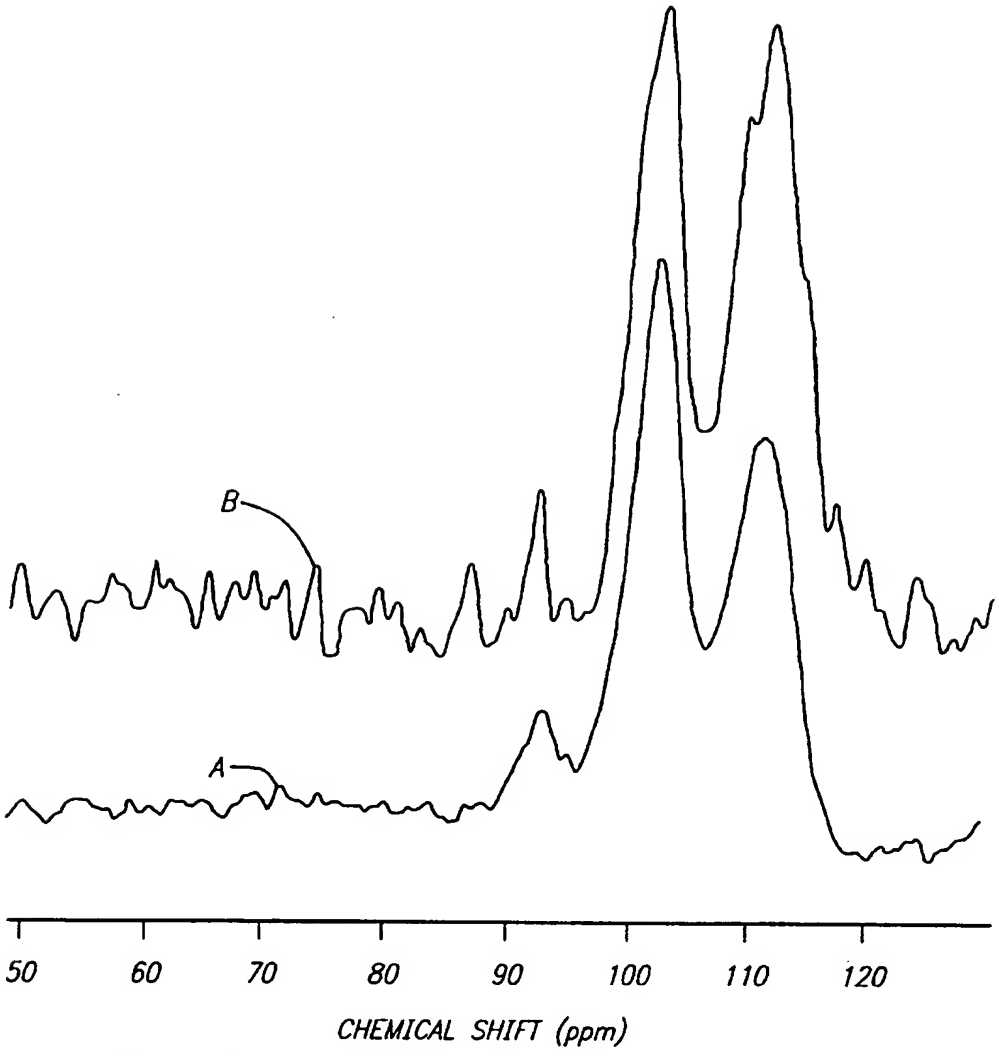


FIG. 8

FIG. 9

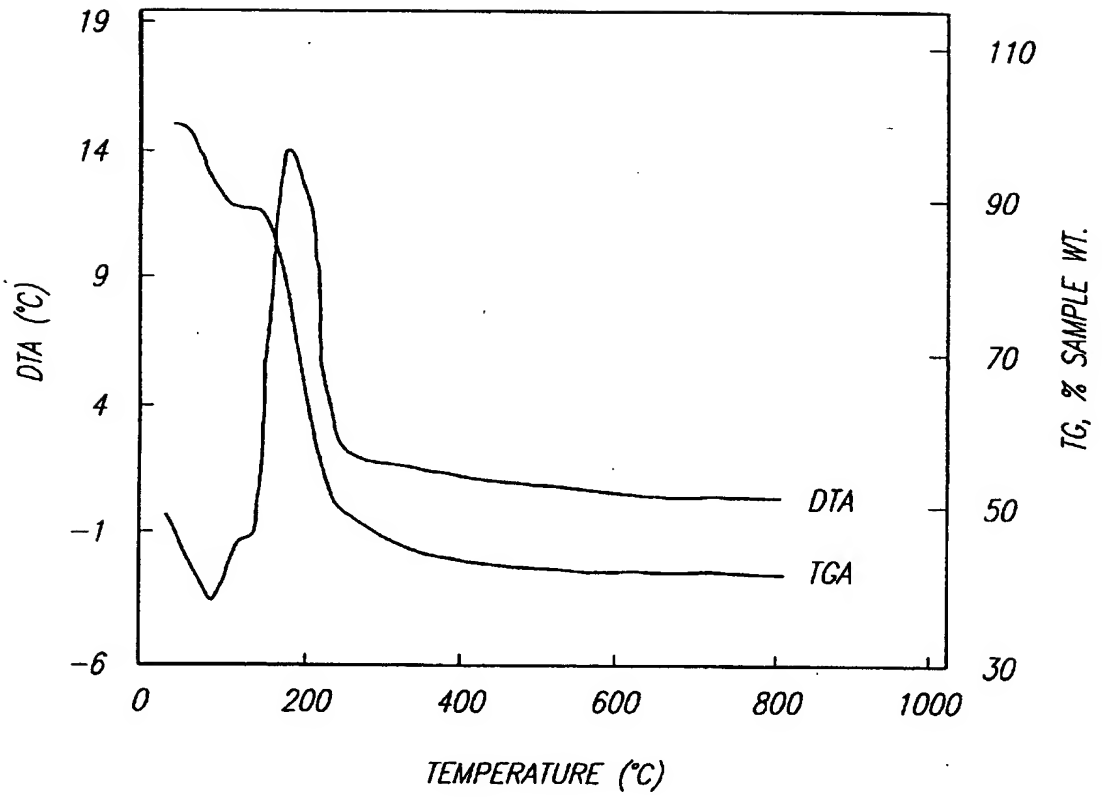

19
14
9
4
−1
−6
DTA (°C)
110
90
70
50
30
TG, % SAMPLE WT.
DTA
TGA
0
200
400
600
800
1000
TEMPERATURE (°C)

FIG. 10a

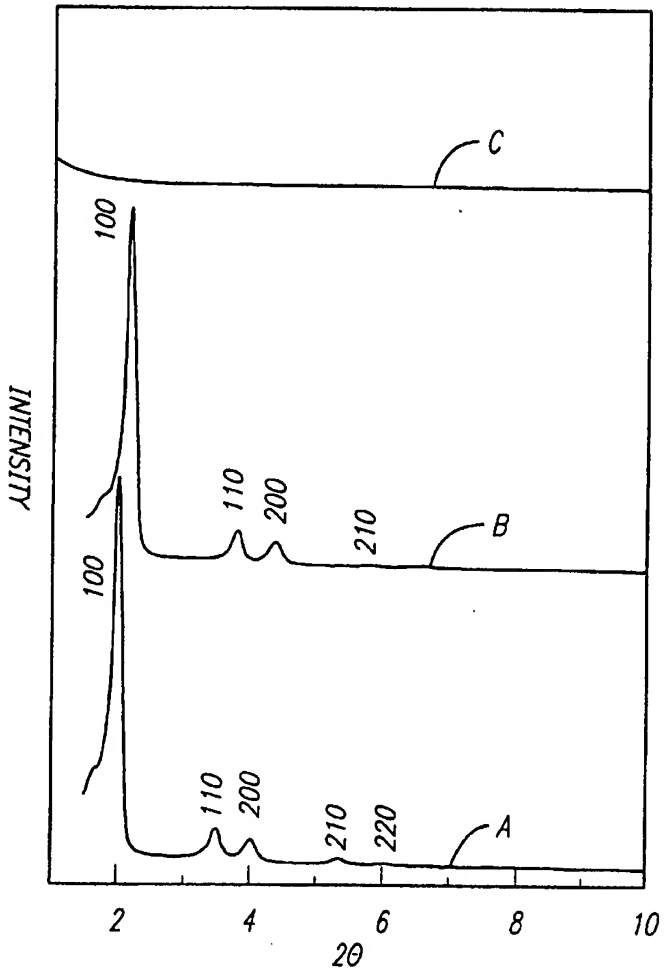


FIG. 10b

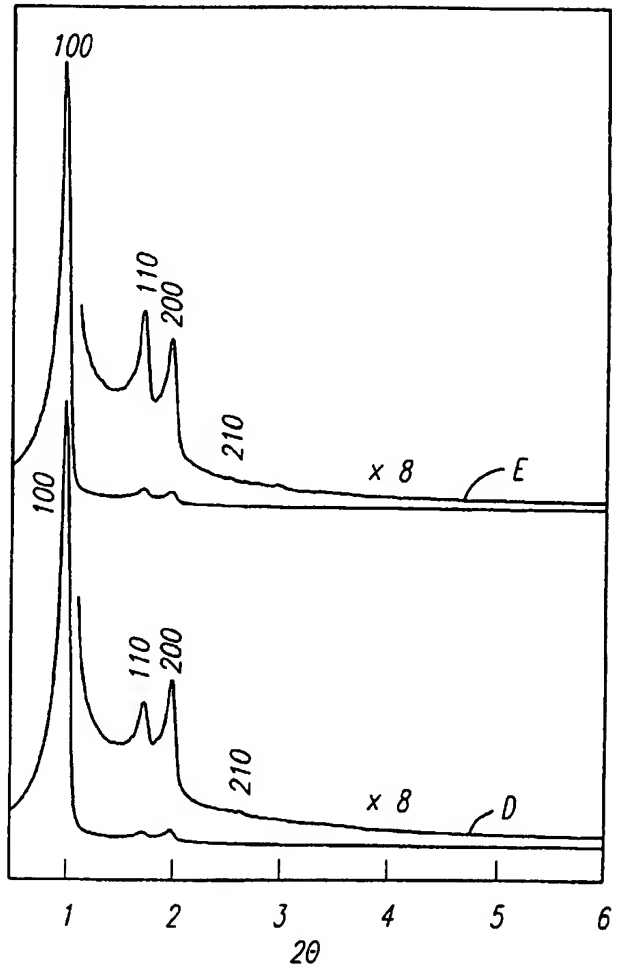


FIG. 11a

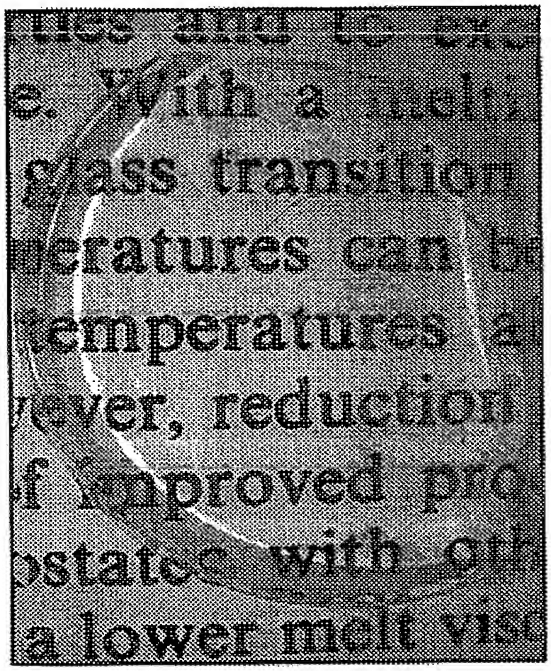
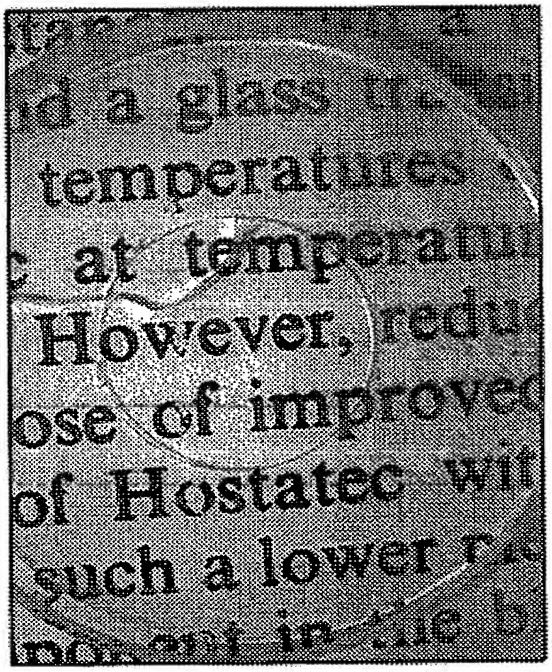


FIG. 11b



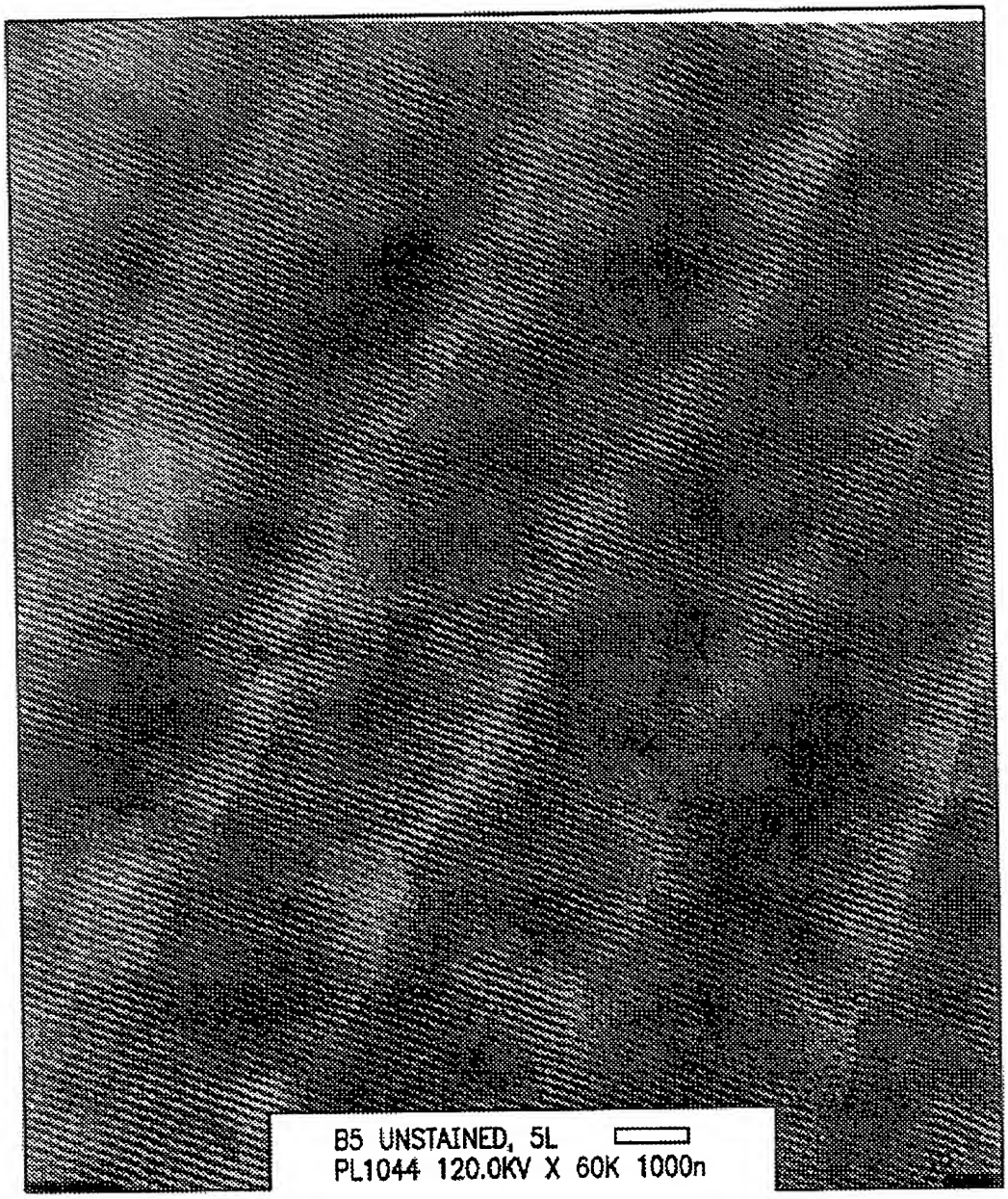


FIG. 12

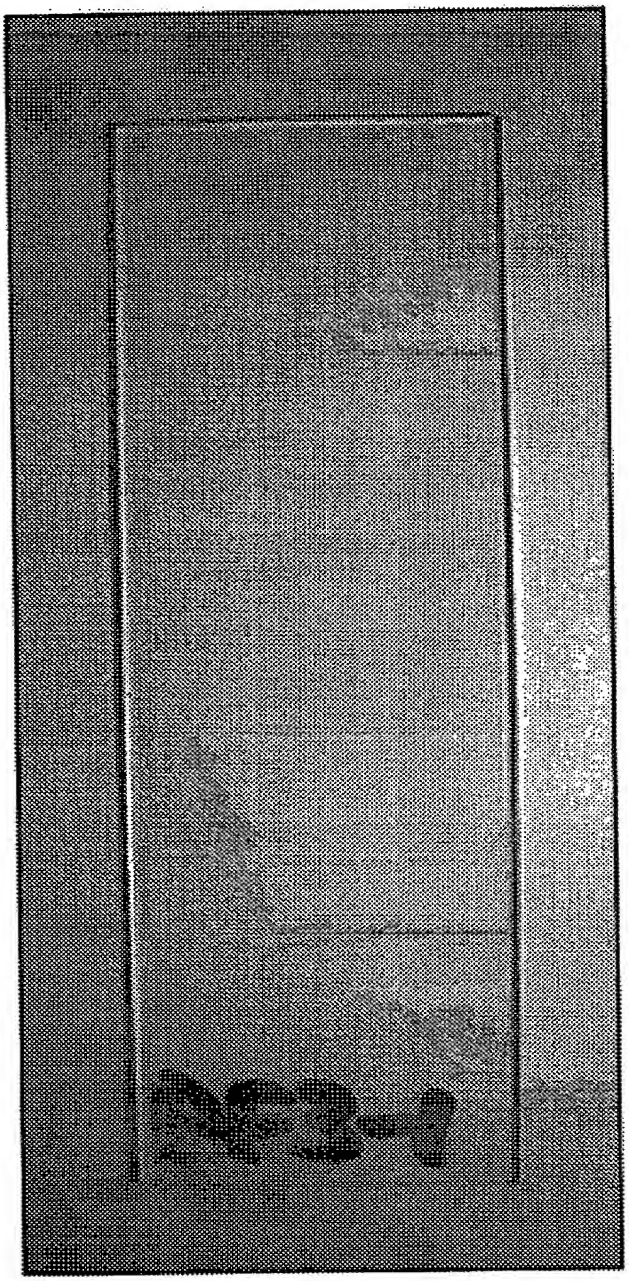


FIG. 13a

FIG. 13b

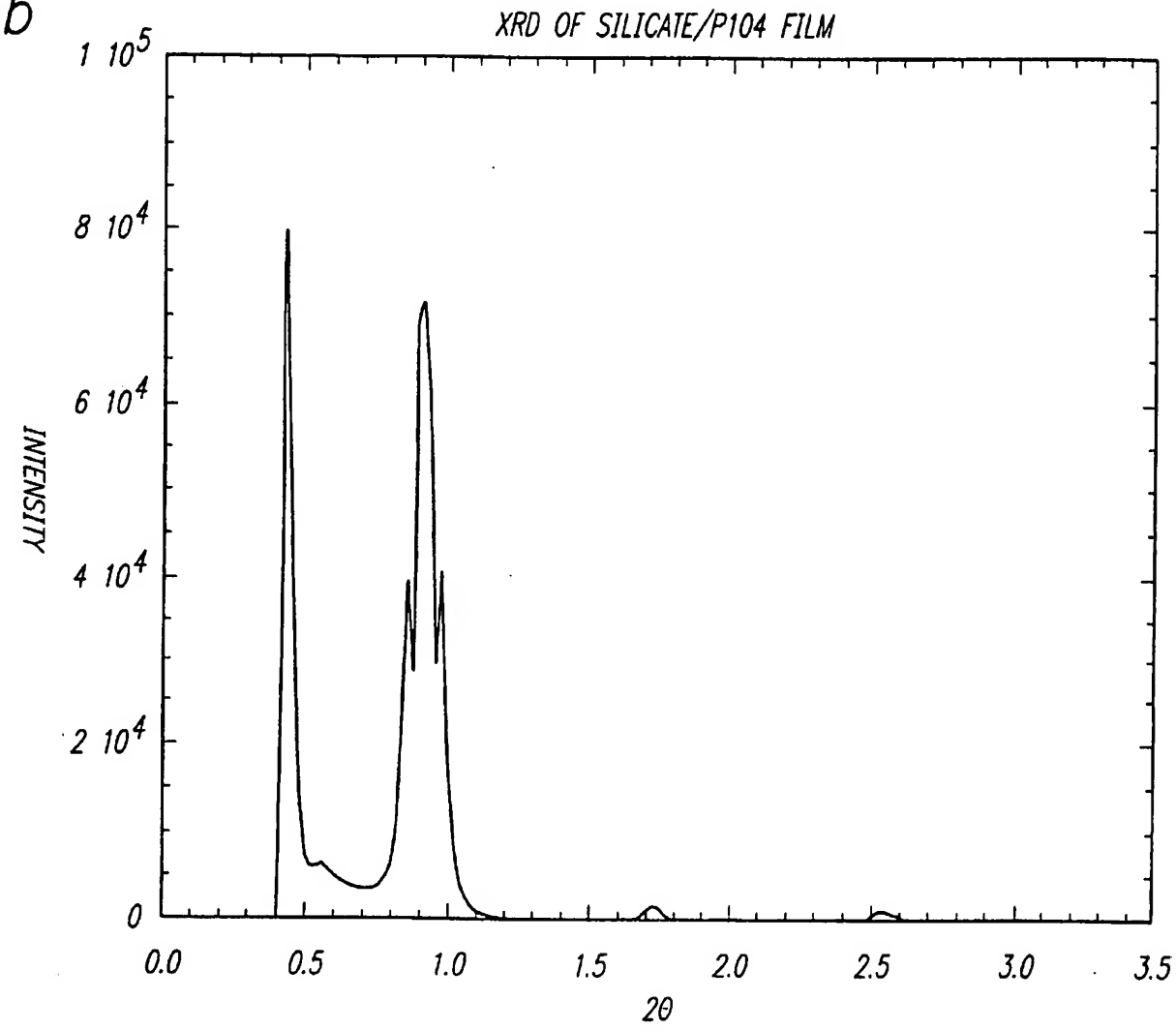

XRD OF SILICATE/P104 FILM
INTENSITY
1 10^5
8 10^4
6 10^4
4 10^4
2 10^4
0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
2θ

FIG. 14

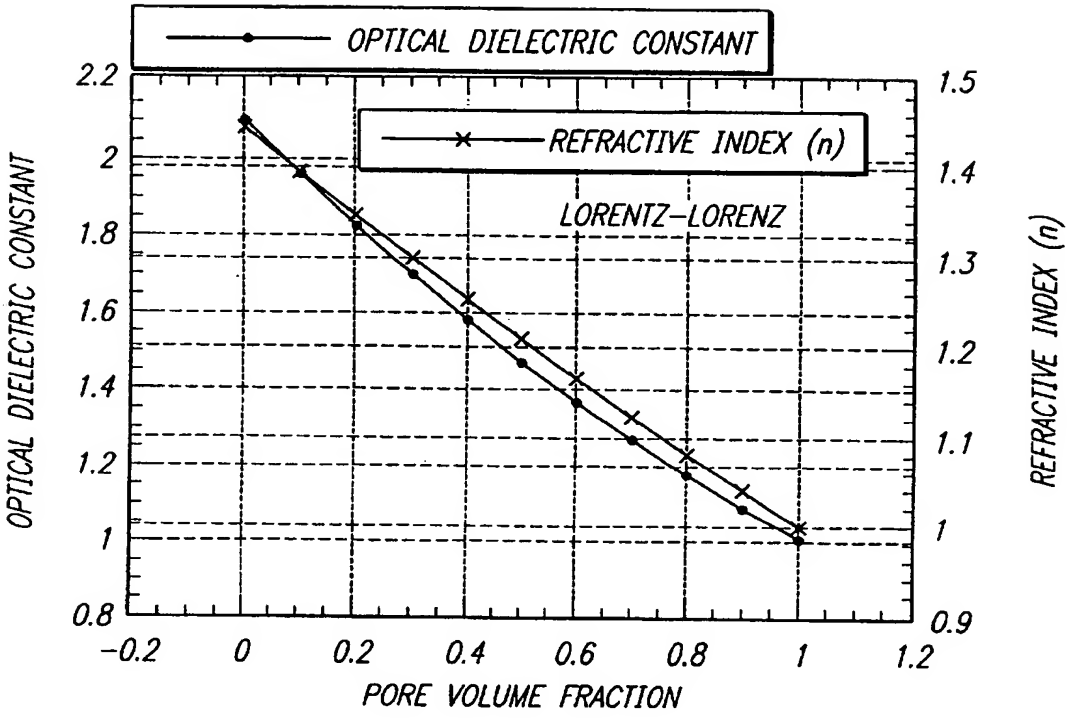
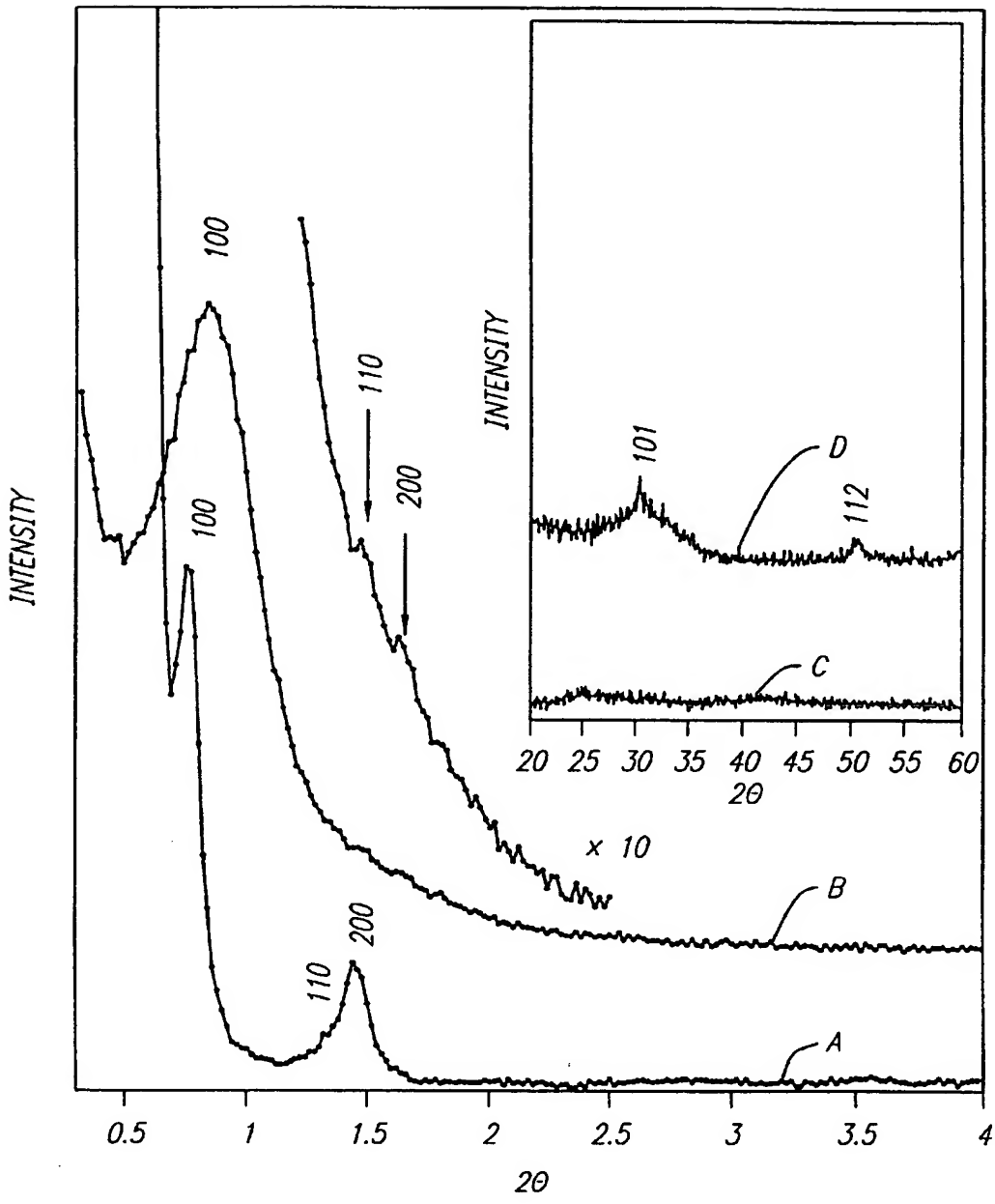

OPTICAL DIELECTRIC CONSTANT
REFRACTIVE INDEX (n)
LORENTZ-LORENZ
OPTICAL DIELECTRIC CONSTANT
REFRACTIVE INDEX (n)
PORE VOLUME FRACTION
2.2
2
1.8
1.6
1.4
1.2
1
0.8
1.5
1.4
1.3
1.2
1.1
1
0.9
-0.2
0
0.2
0.4
0.6
0.8
1
1.2

FIG. 15


INTENSITY
100
100
110
200
110
200
x 10
A
B
0.5
1
1.5
2
2.5
3
3.5
4
2θ
INTENSITY
101
D
112
C
20
25
30
35
40
45
50
55
60
2θ

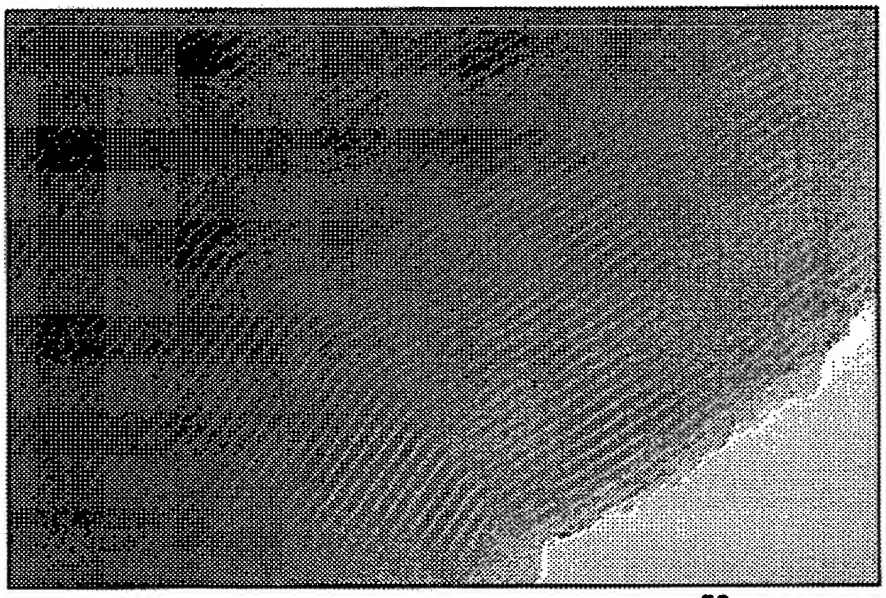


FIG. 16a

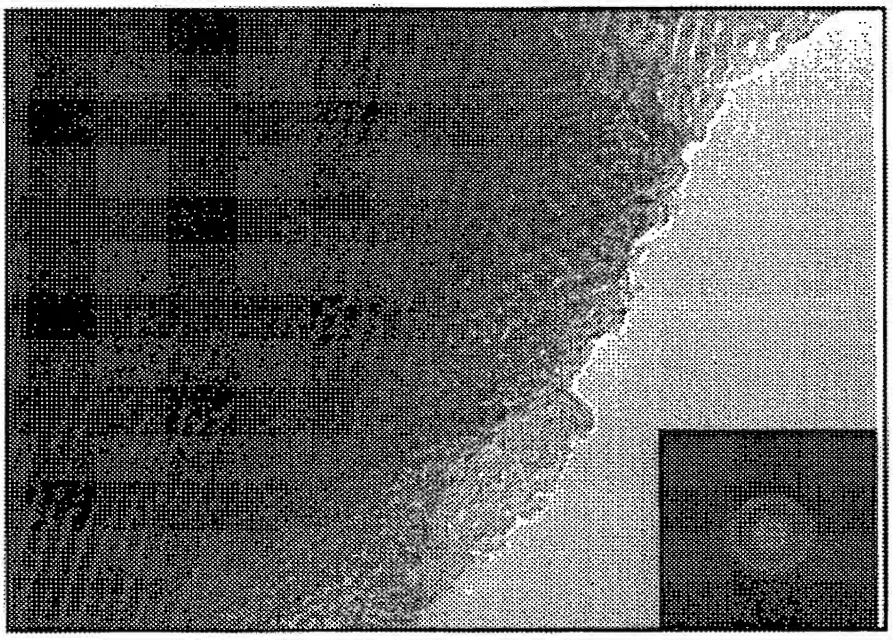


FIG. 16b

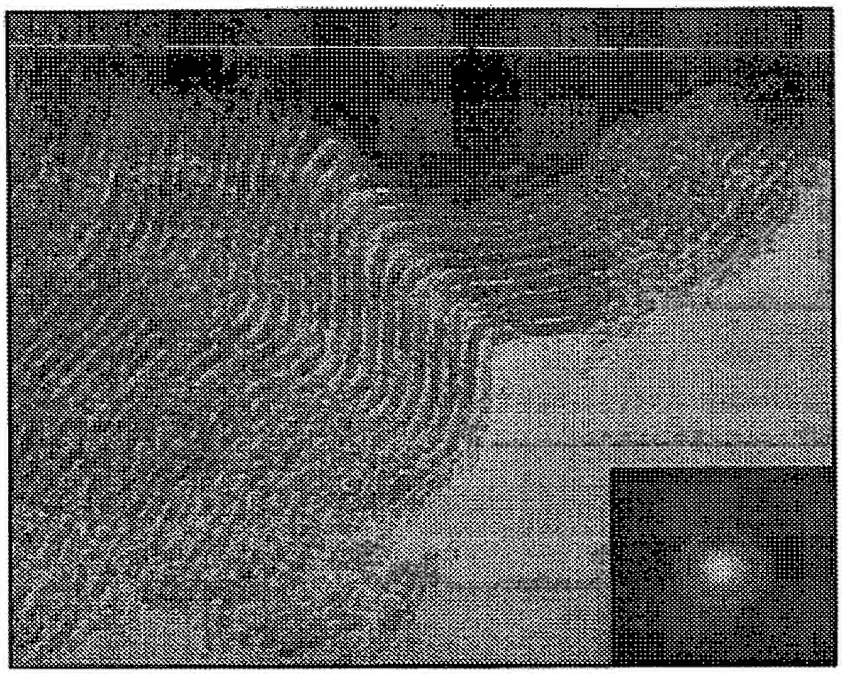


FIG. 17a

20 nm

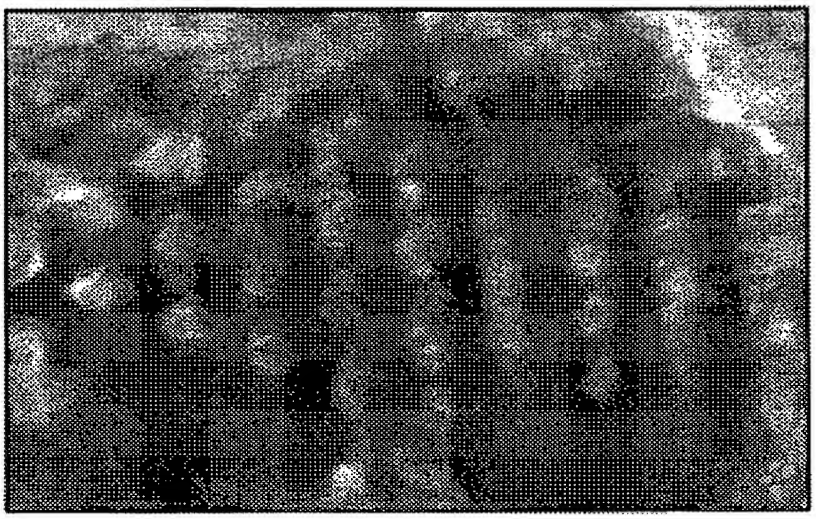


FIG. 17b

20 nm

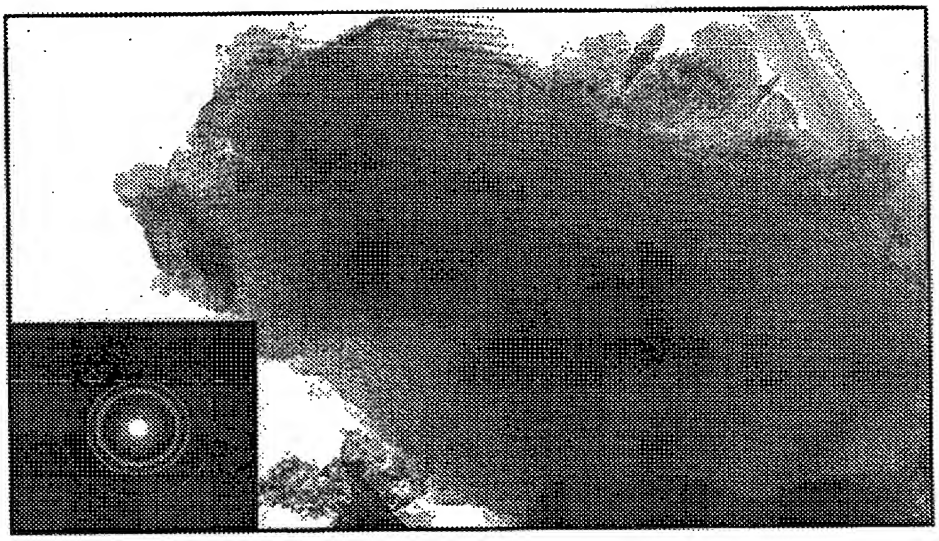


FIG. 18a

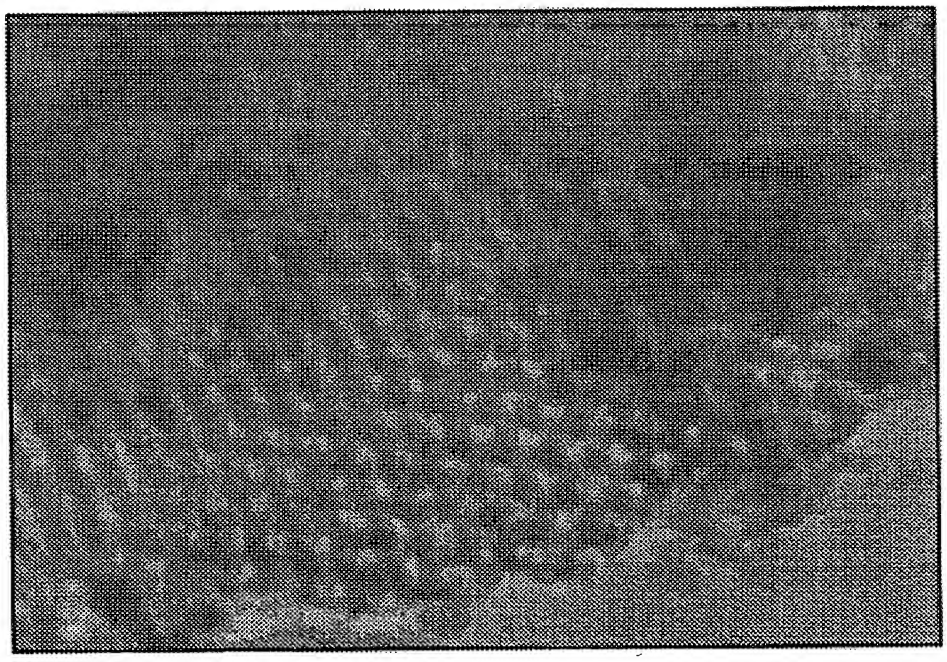


FIG. 18b

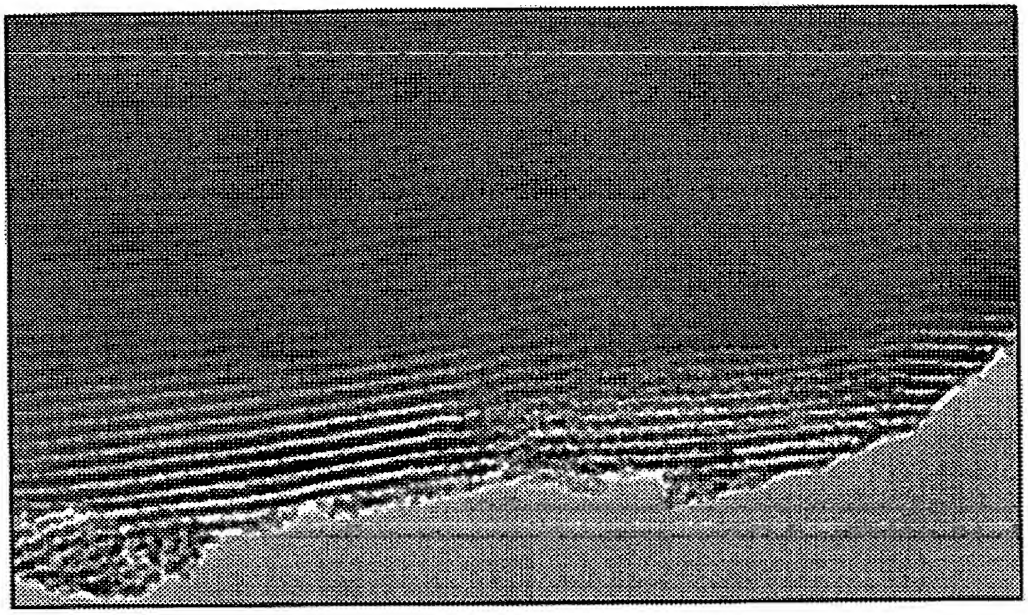


FIG. 19a

100 nm

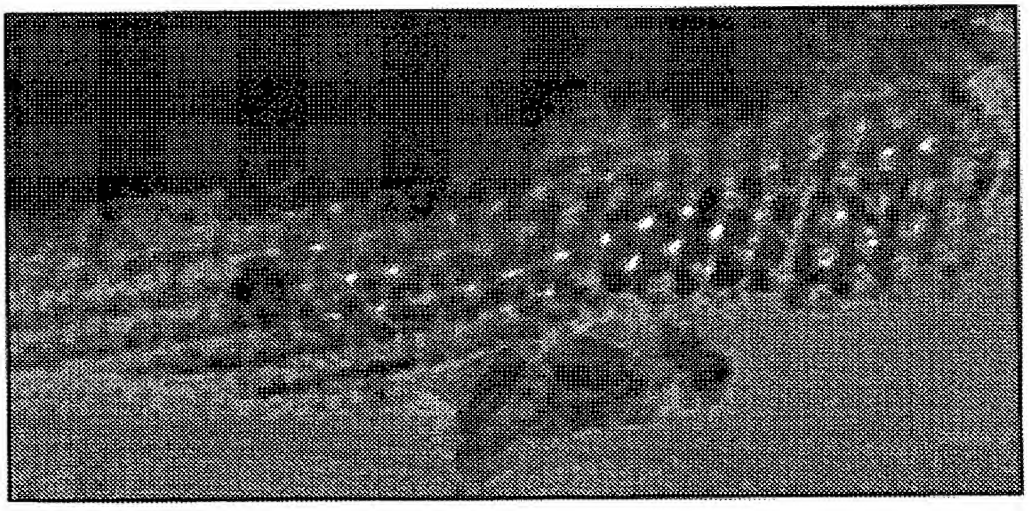


FIG. 19b

50 nm

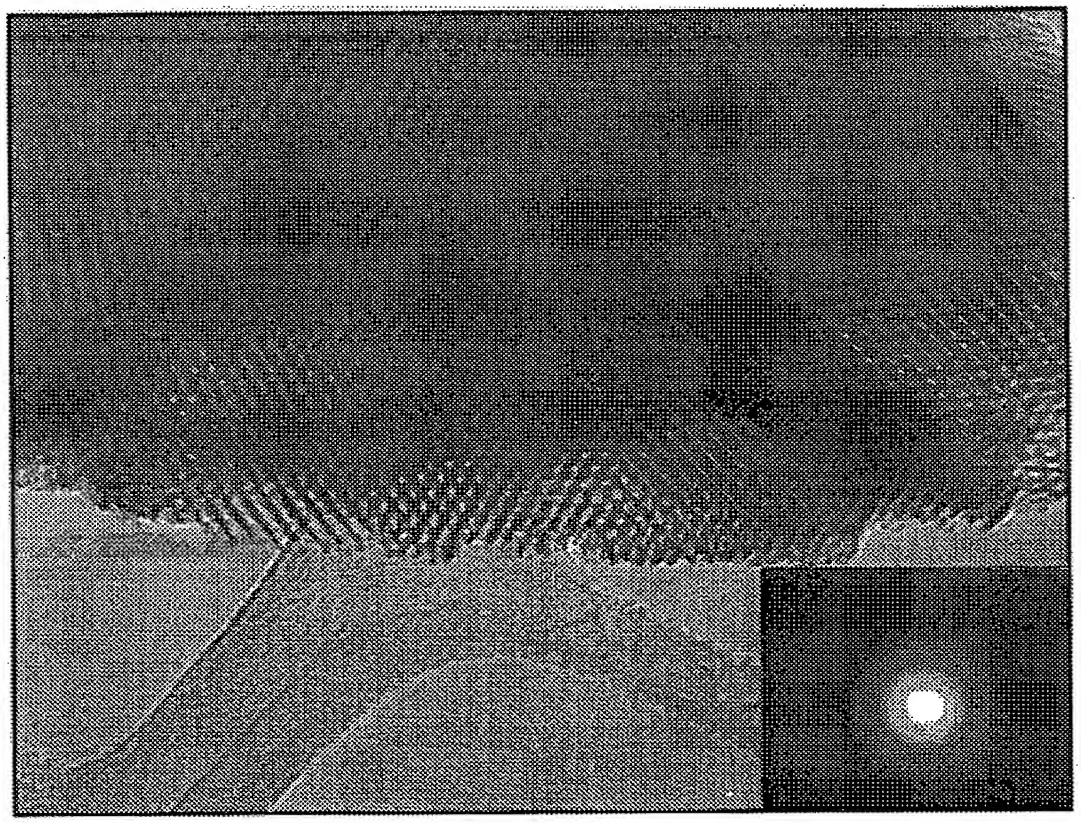


FIG. 20

20 nm

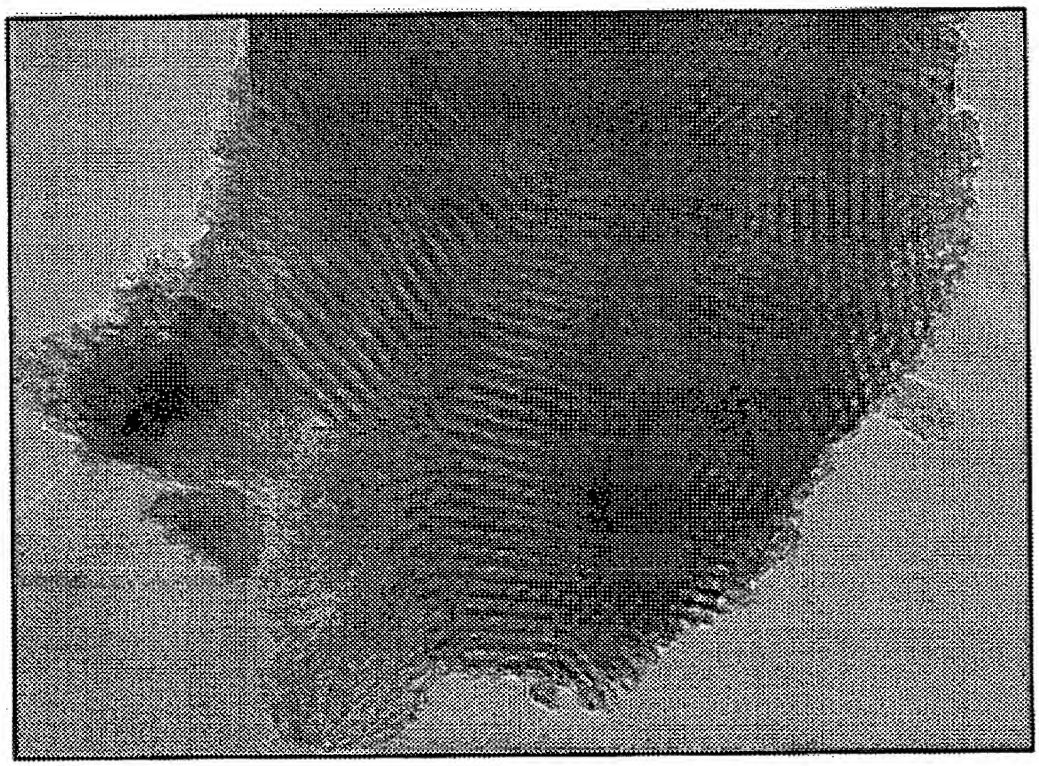


FIG. 21

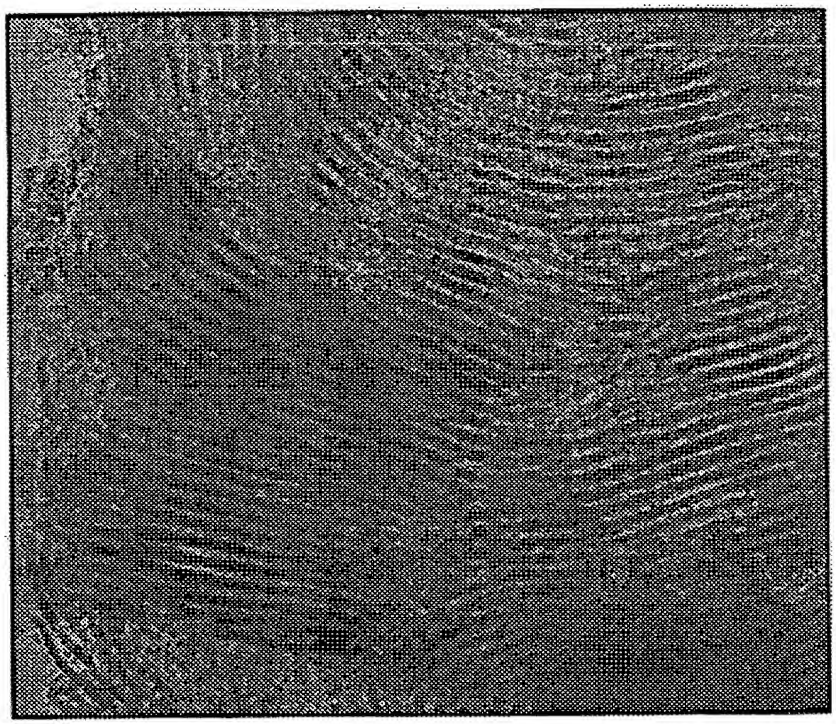


FIG. 22a

FIG. 22b

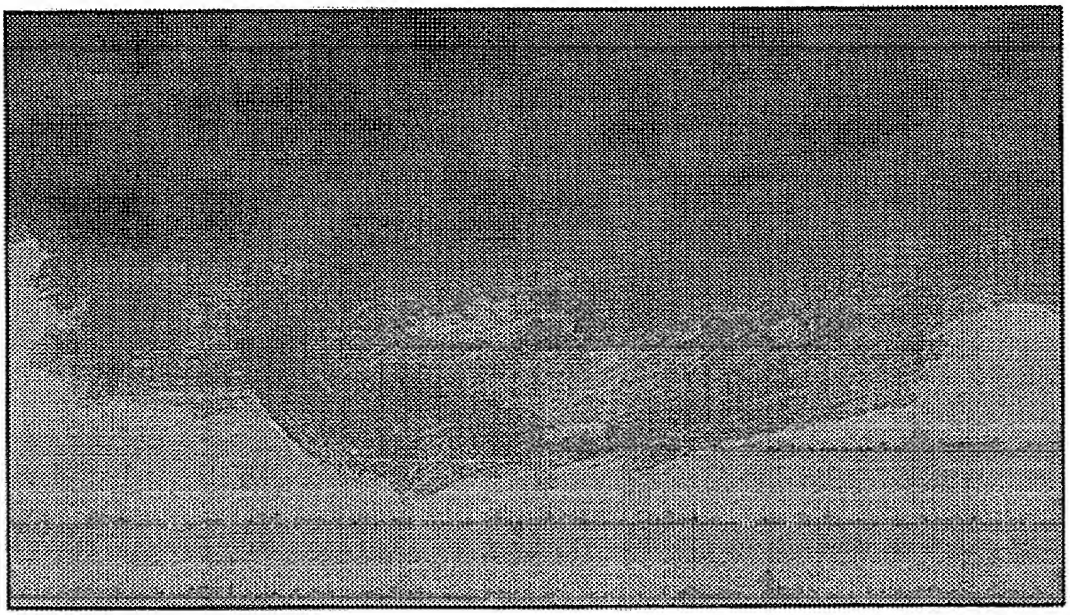


FIG. 23

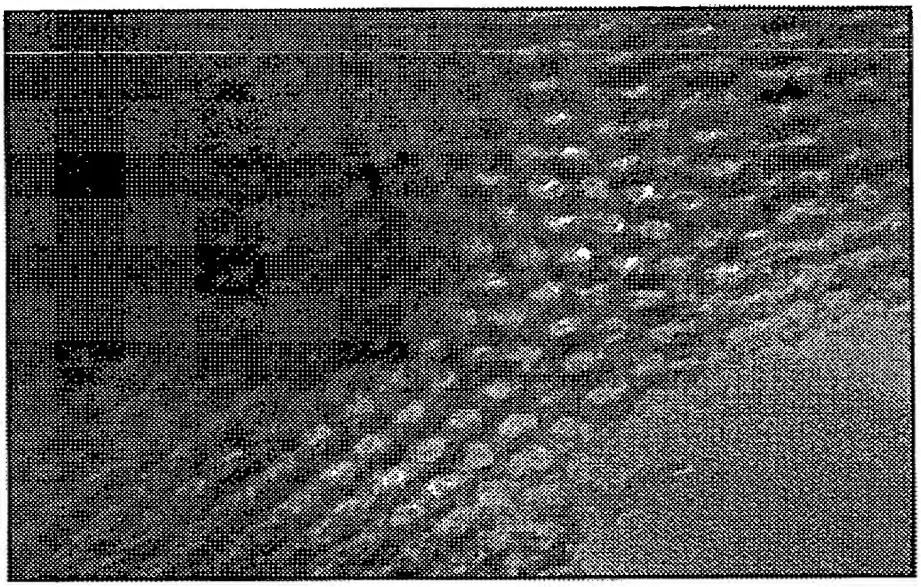


FIG. 24a

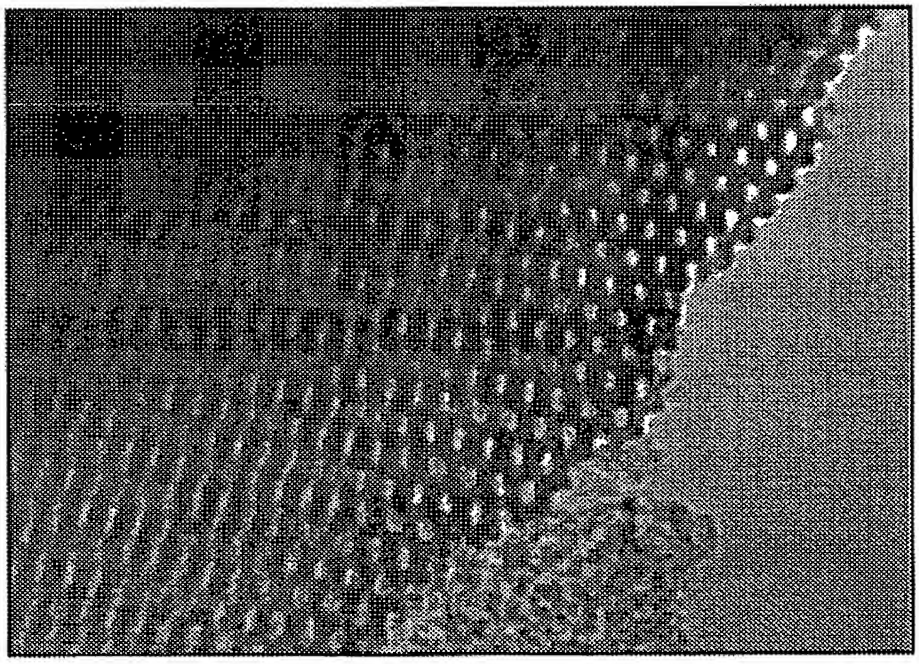


FIG. 24b

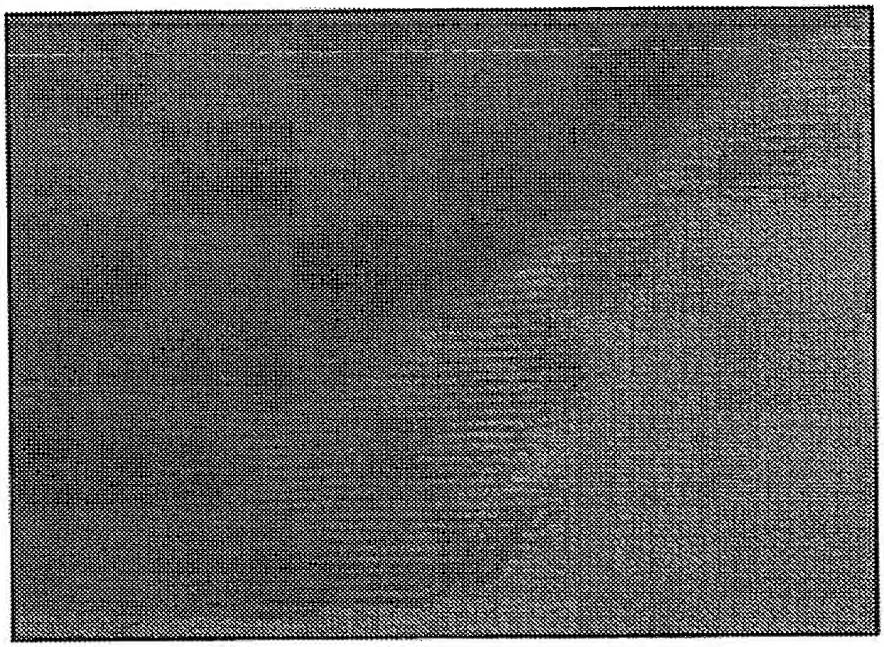


FIG. 25a

50 nm

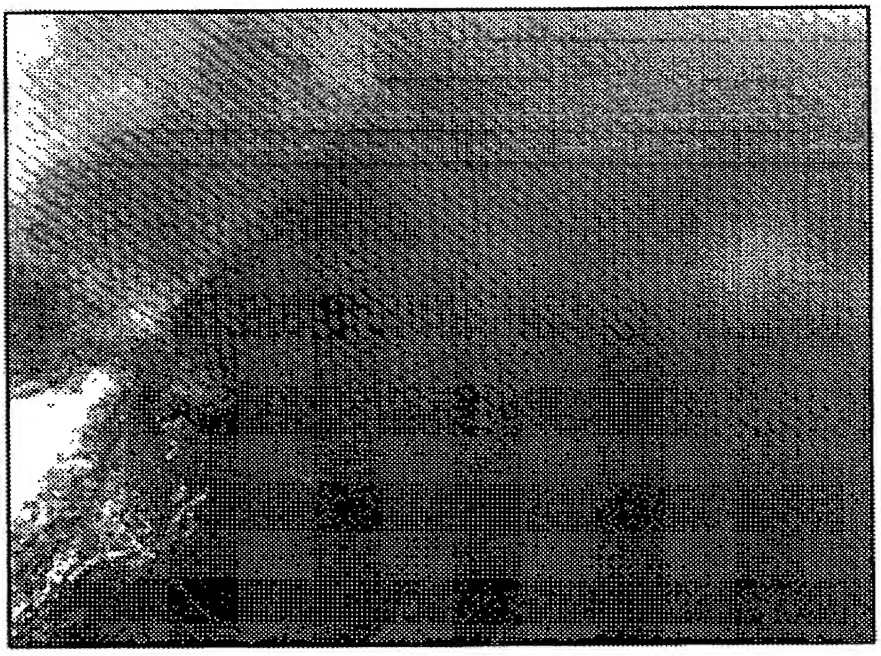


FIG. 25b

50 nm

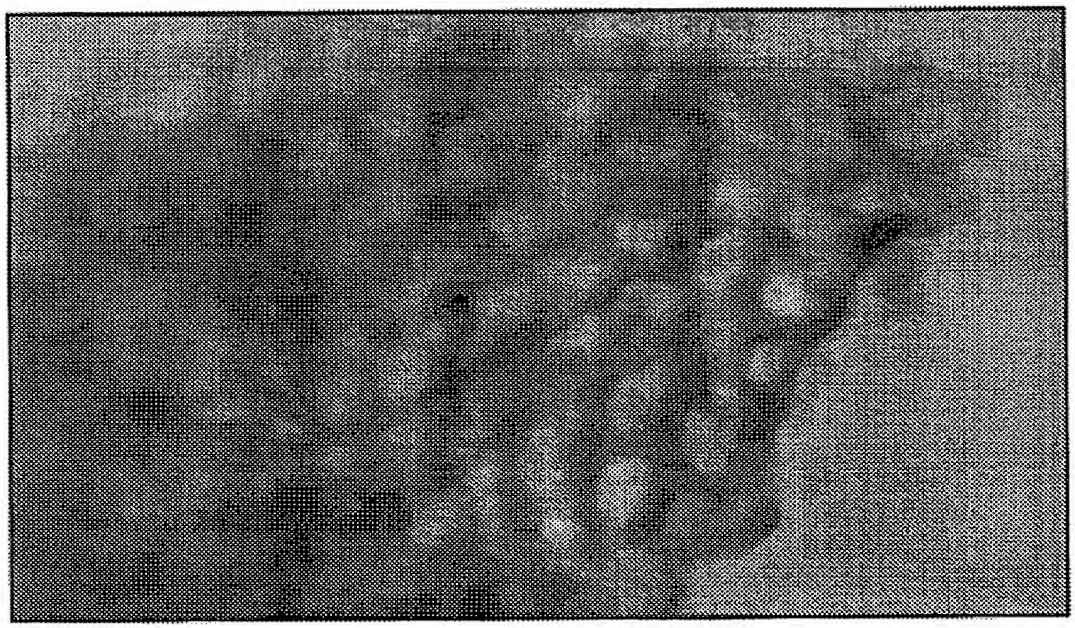


FIG. 26

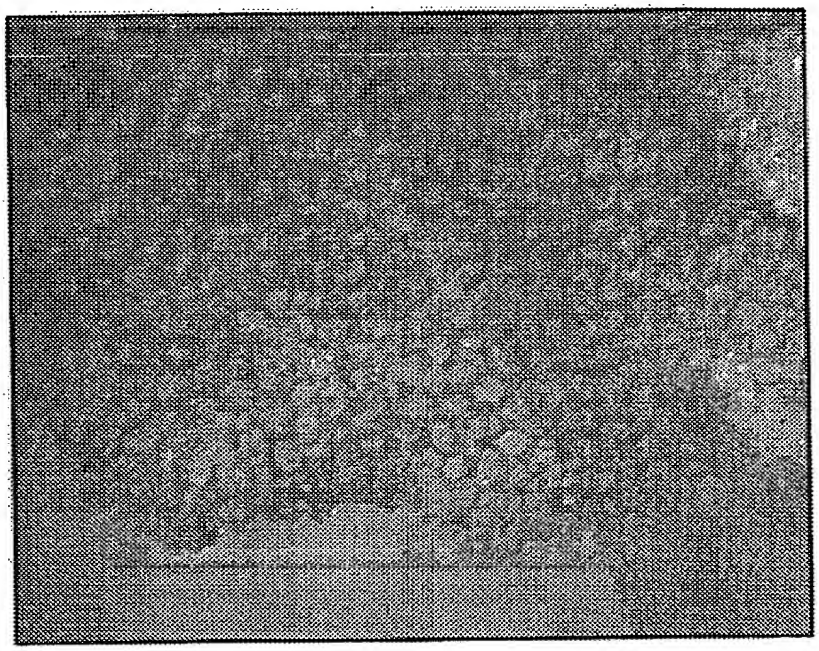


FIG. 27a

20 nm

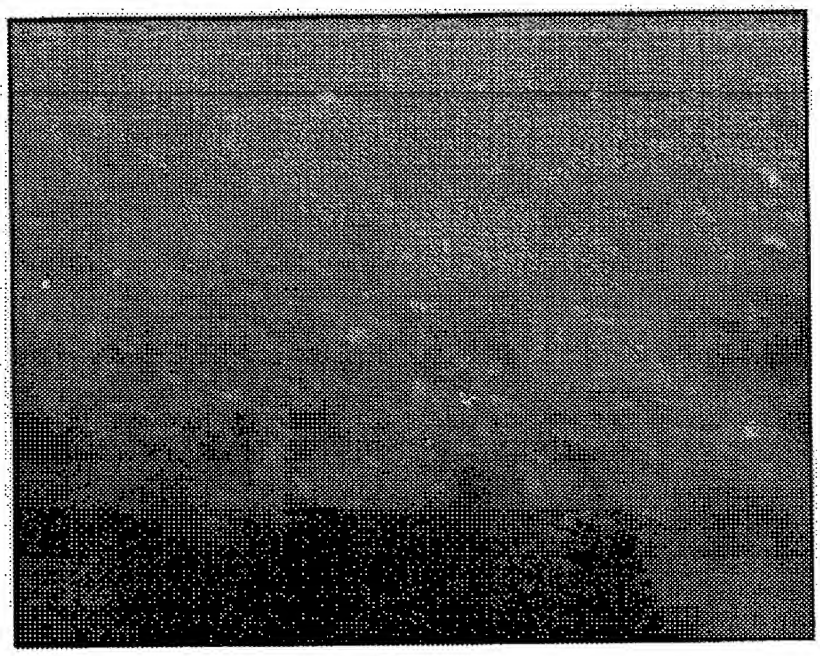


FIG. 27b

20 nm

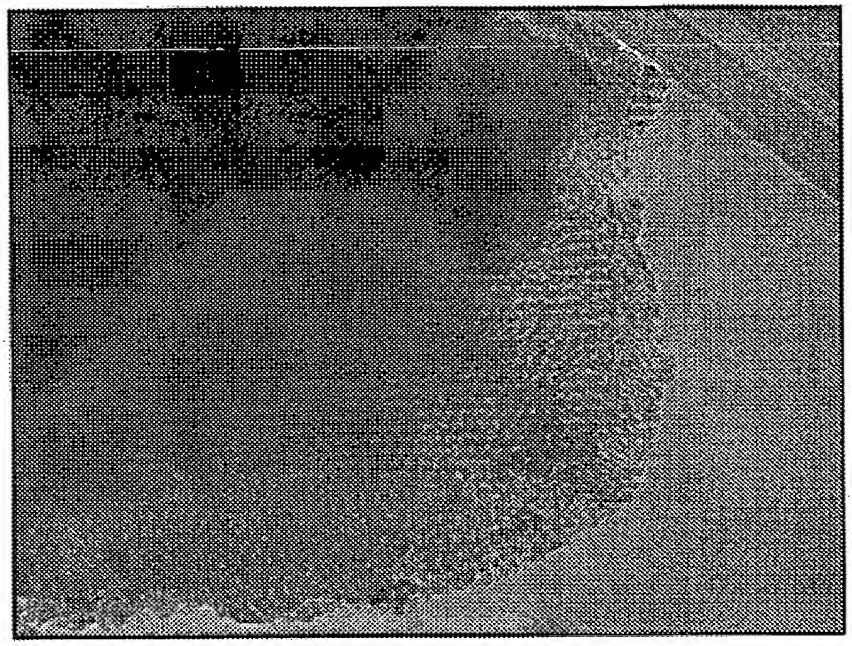


FIG. 28a

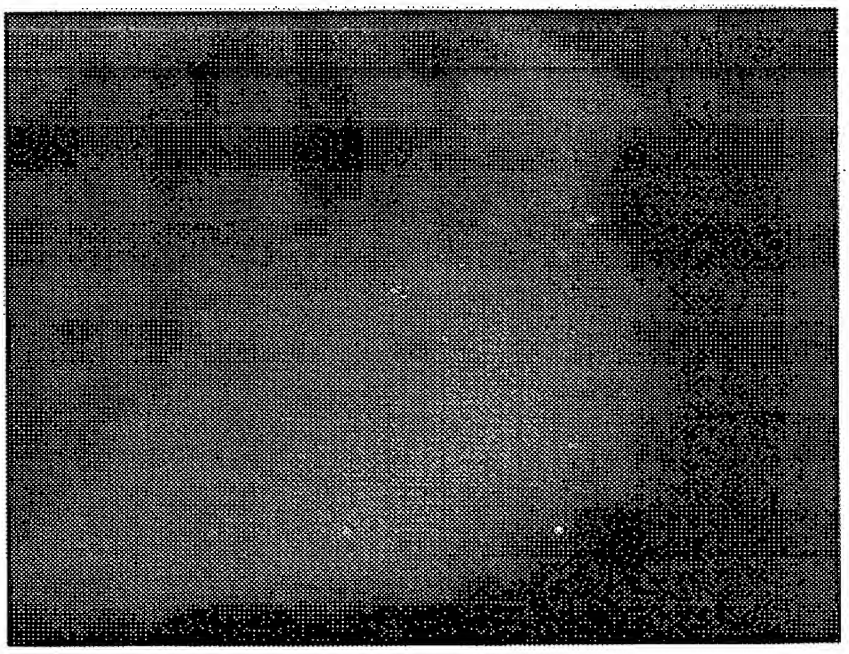


FIG. 28b

FIG. 29

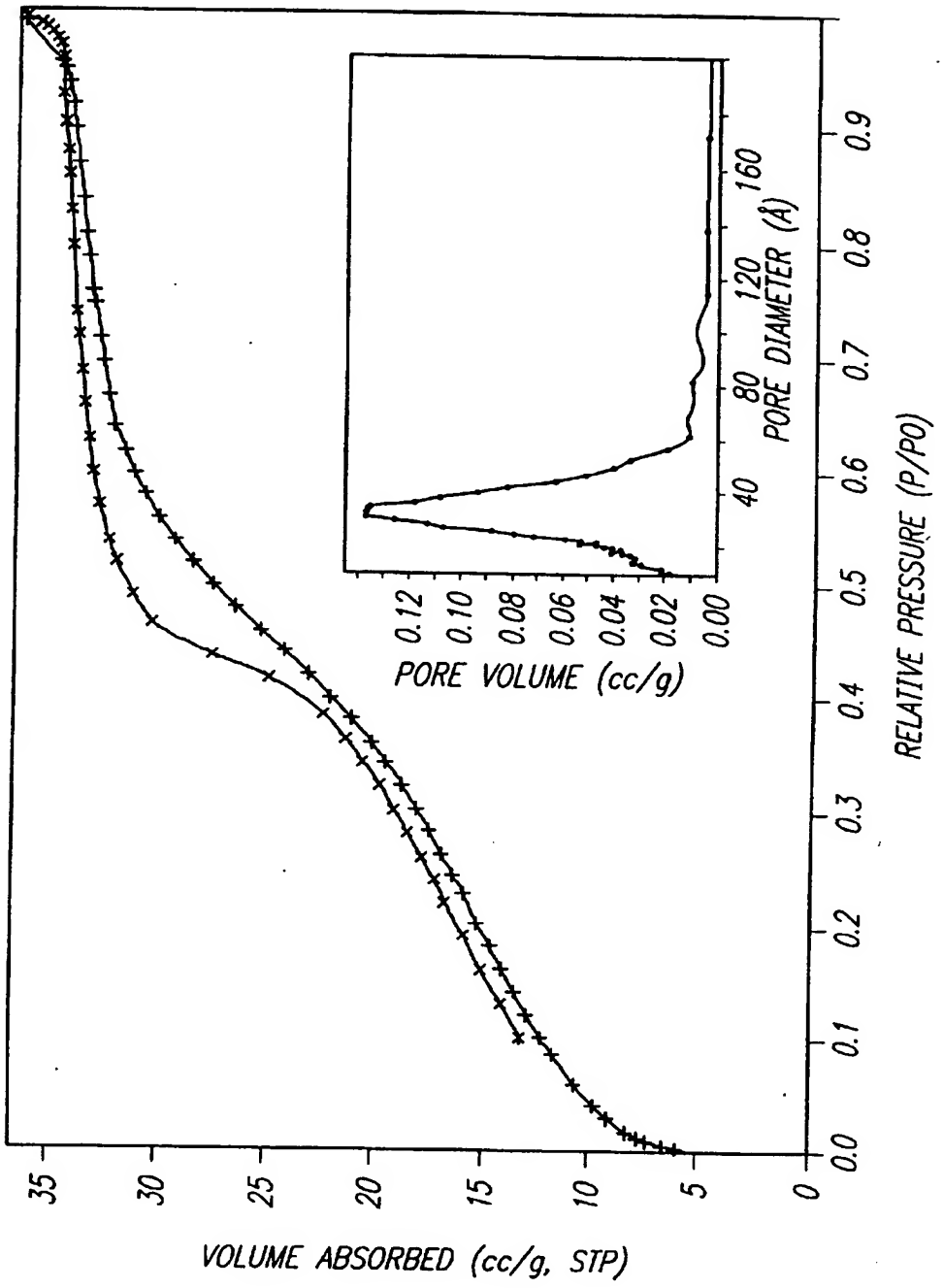

VOLUME ABSORBED (cc/g, STP)
0
5
10
15
20
25
30
35
RELATIVE PRESSURE (P/PO)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
PORE VOLUME (cc/g)
0.00
0.02
0.04
0.06
0.08
0.10
0.12
PORE DIAMETER (Å)
40
80
120
160

FIG. 30a

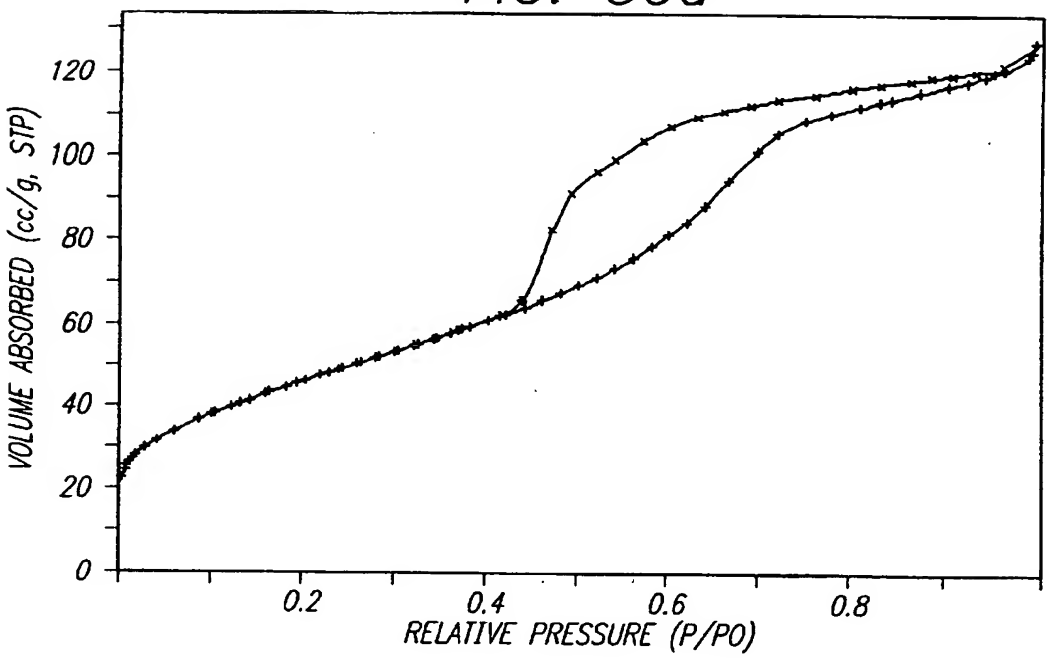


FIG. 30b

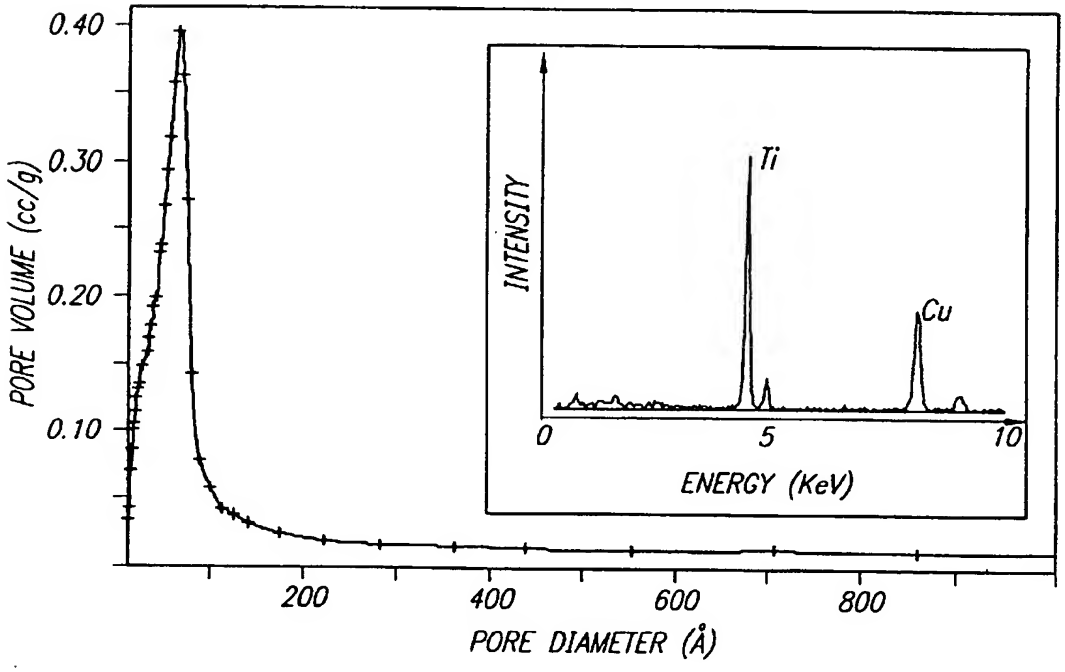


FIG. 31

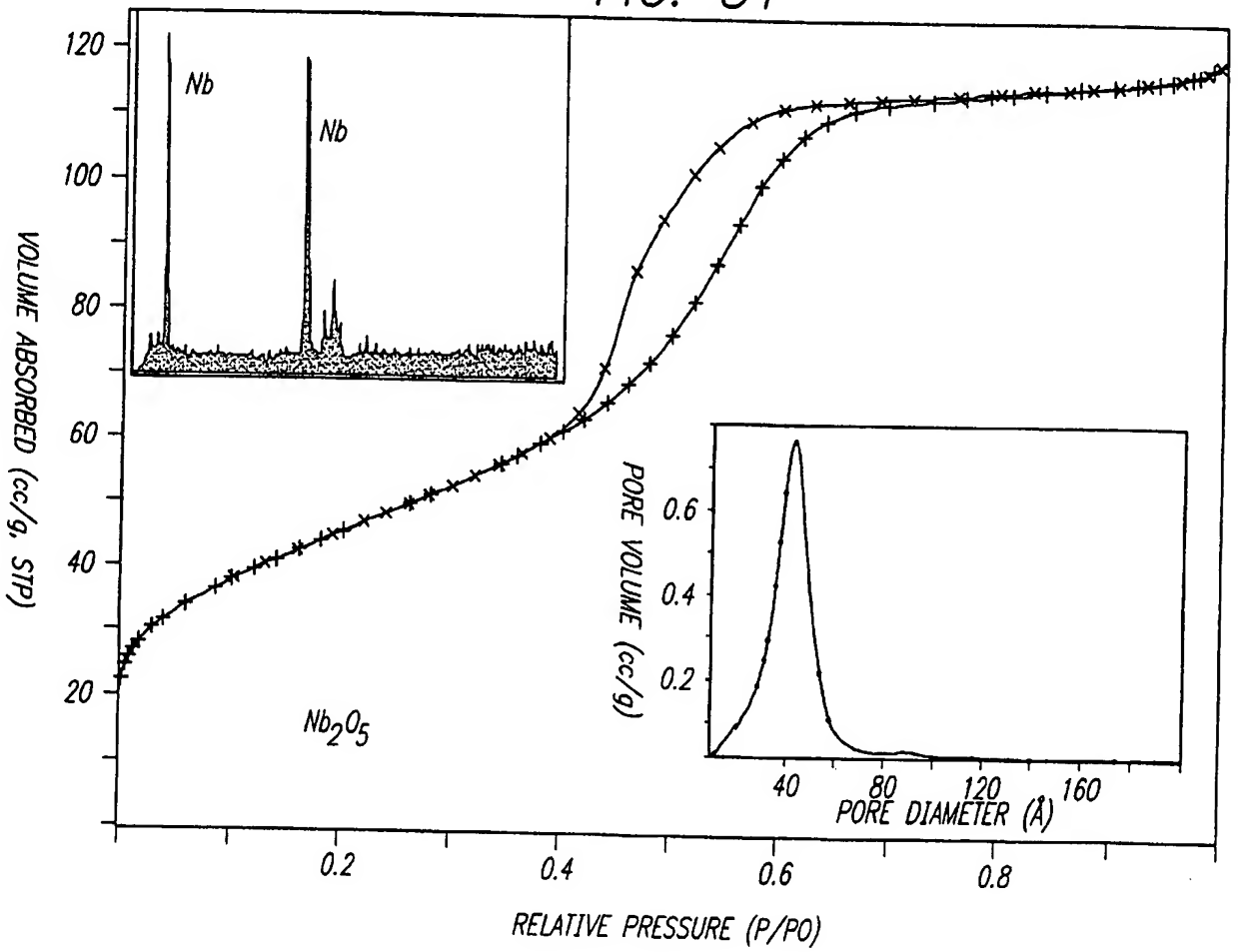

120
100
80
60
40
20
VOLUME ABSORBED (cc/g. STP)
Nb
Nb
Nb_2O_5
0.2
0.4
0.6
0.8
RELATIVE PRESSURE (P/PO)
PORE VOLUME (cc/g)
0.6
0.4
0.2
40
80
120
160
PORE DIAMETER (Å)

FIG. 32

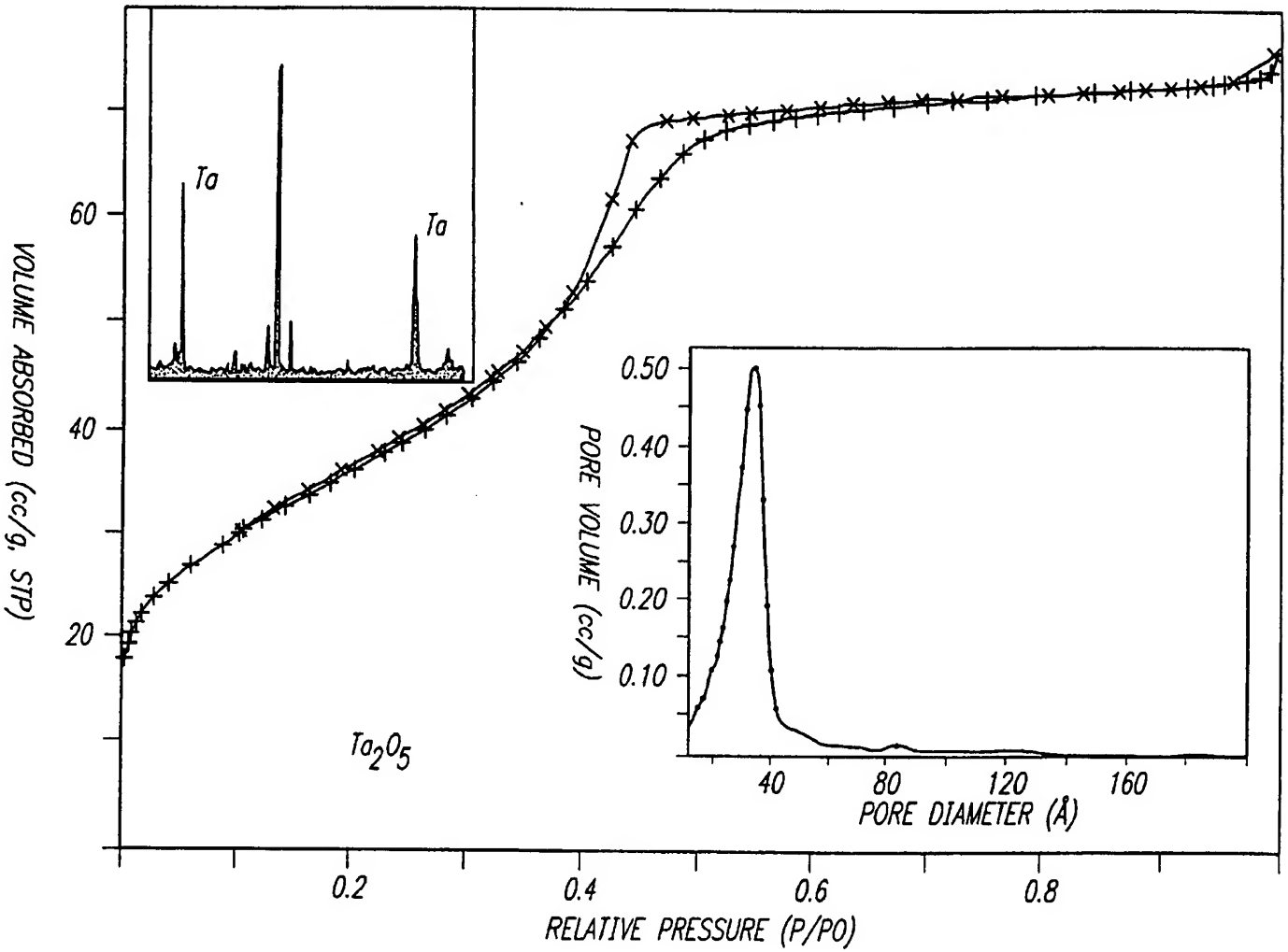

Ta
Ta
60
40
20
VOLUME ABSORBED (cc/g, STP)
Ta_2O_5
0.50
0.40
0.30
0.20
0.10
PORE VOLUME (cc/g)
40
80
120
160
PORE DIAMETER (Å)
0.2
0.4
0.6
0.8
RELATIVE PRESSURE (P/PO)

FIG. 33

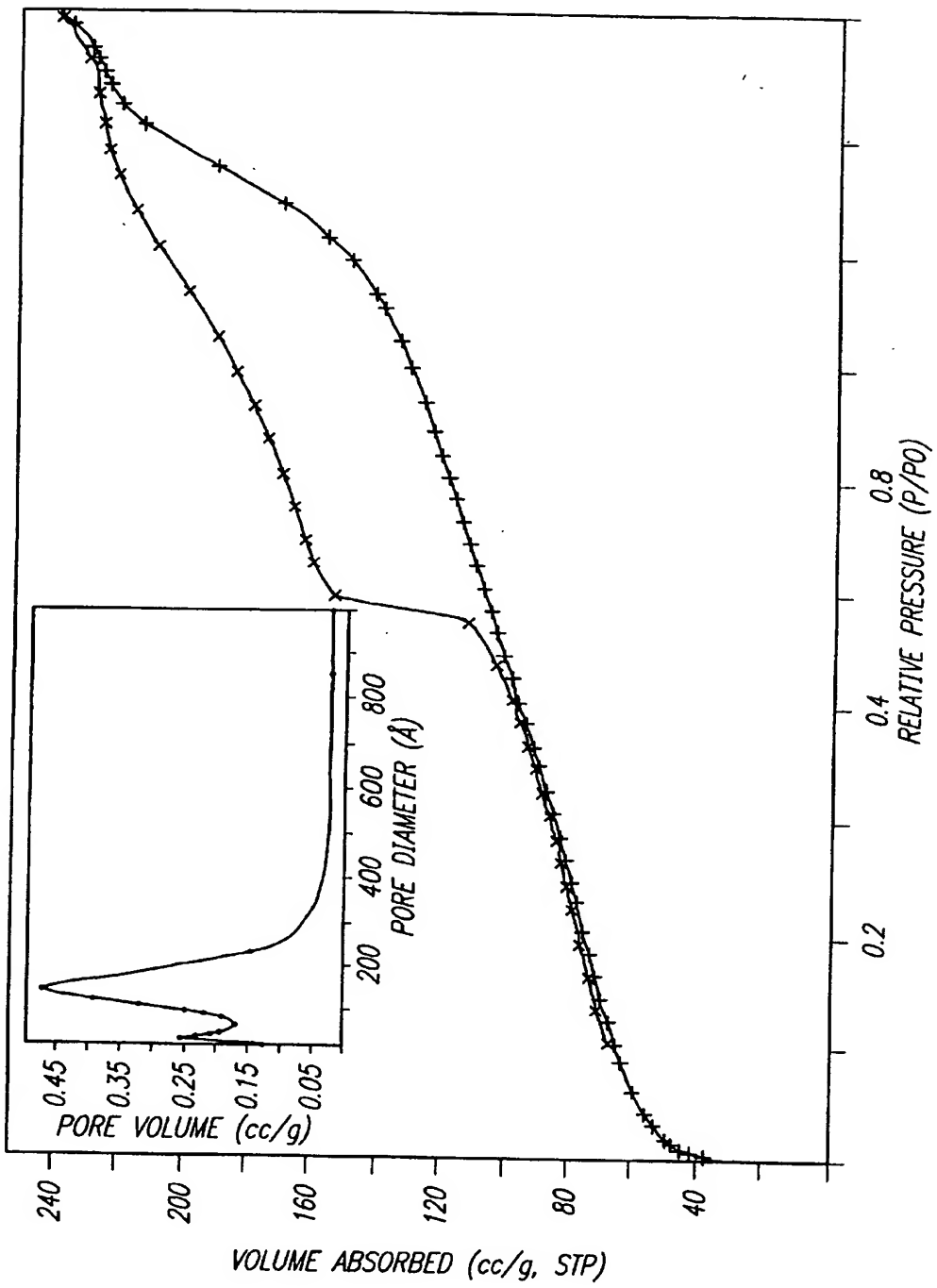

VOLUME ABSORBED (cc/g, STP)
240
200
160
120
80
40
0.2
0.4
0.8
RELATIVE PRESSURE (P/PO)
PORE VOLUME (cc/g)
0.45
0.35
0.25
0.15
0.05
200
400
600
800
PORE DIAMETER (Å)

FIG. 34

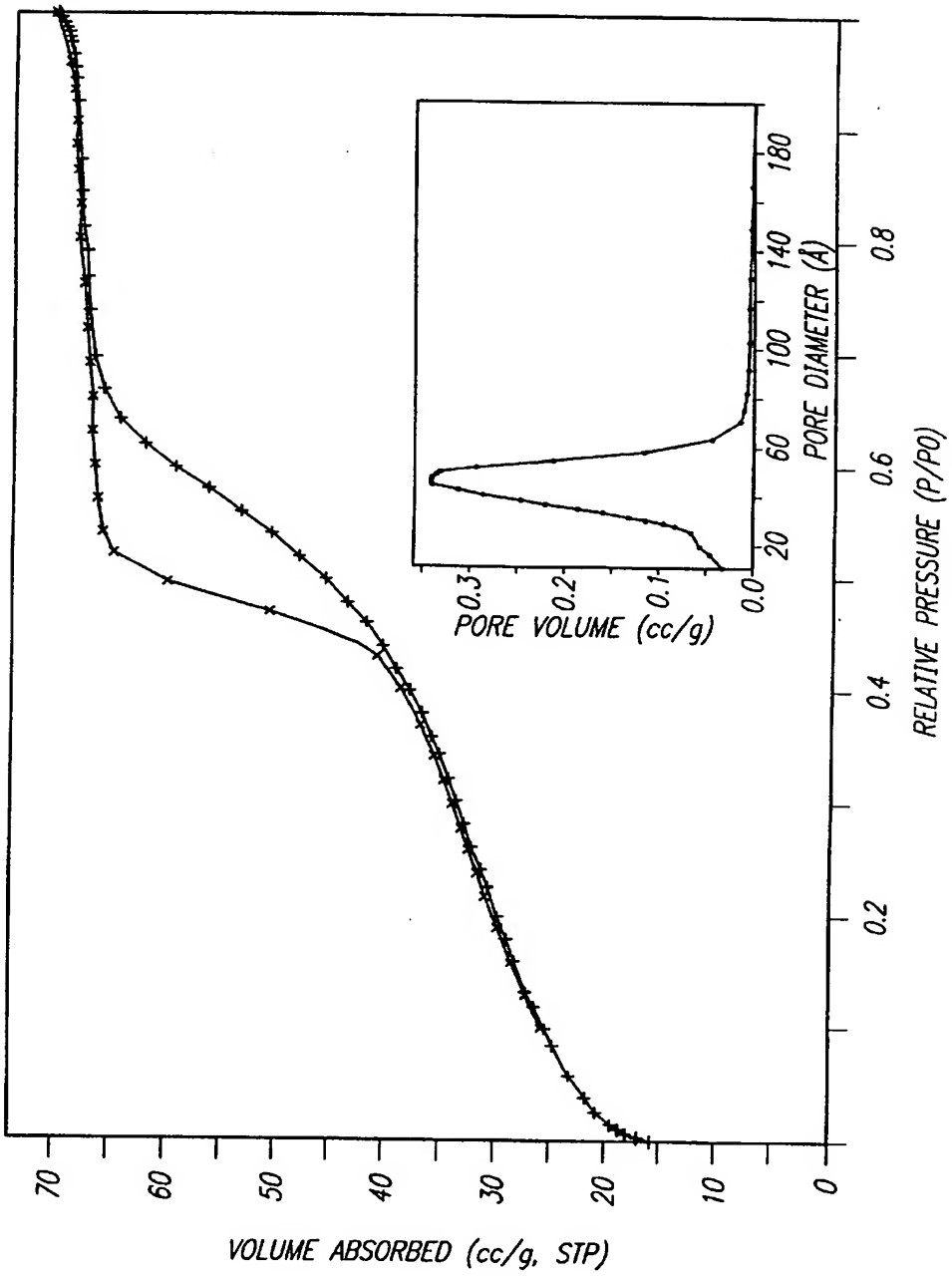

VOLUME ABSORBED (cc/g, STP)
0
10
20
30
40
50
60
70
0.2
0.4
0.6
0.8
RELATIVE PRESSURE (P/PO)
PORE VOLUME (cc/g)
0.0
0.1
0.2
0.3
PORE DIAMETER (Å)
20
60
100
140
180

FIG. 35a

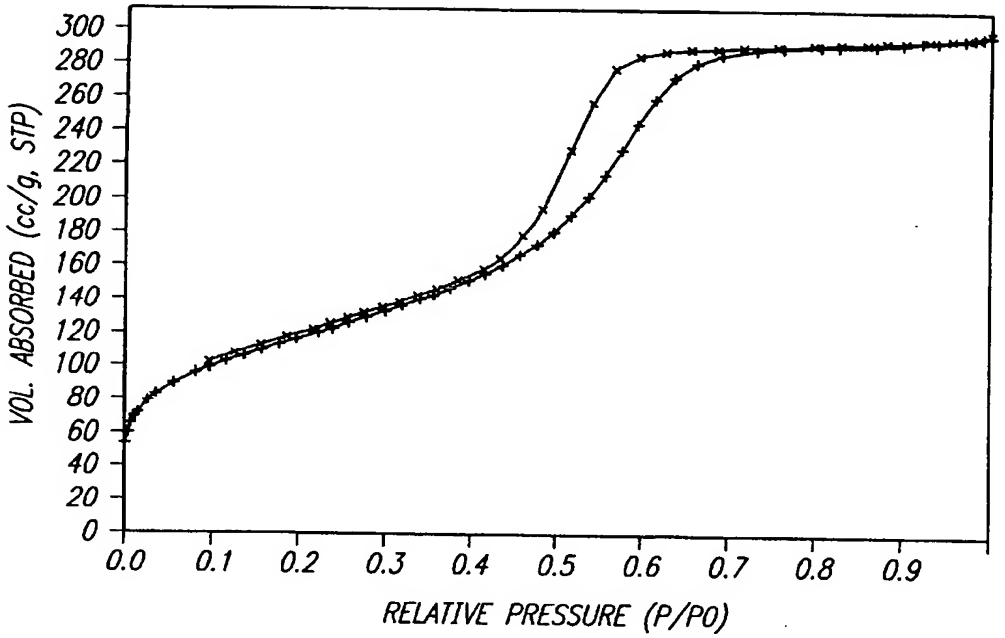


FIG. 35b

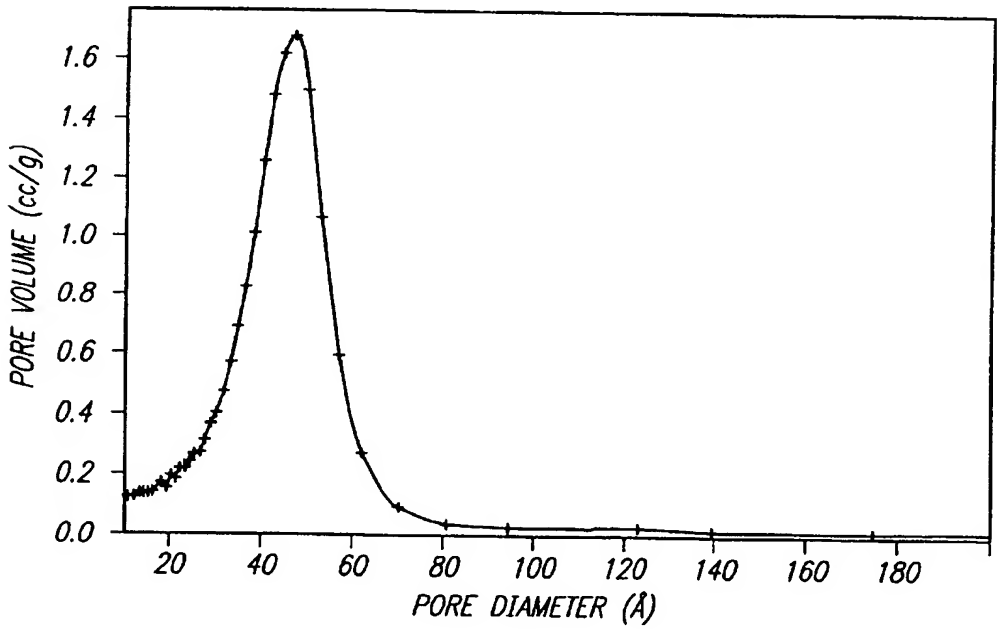


FIG. 36a

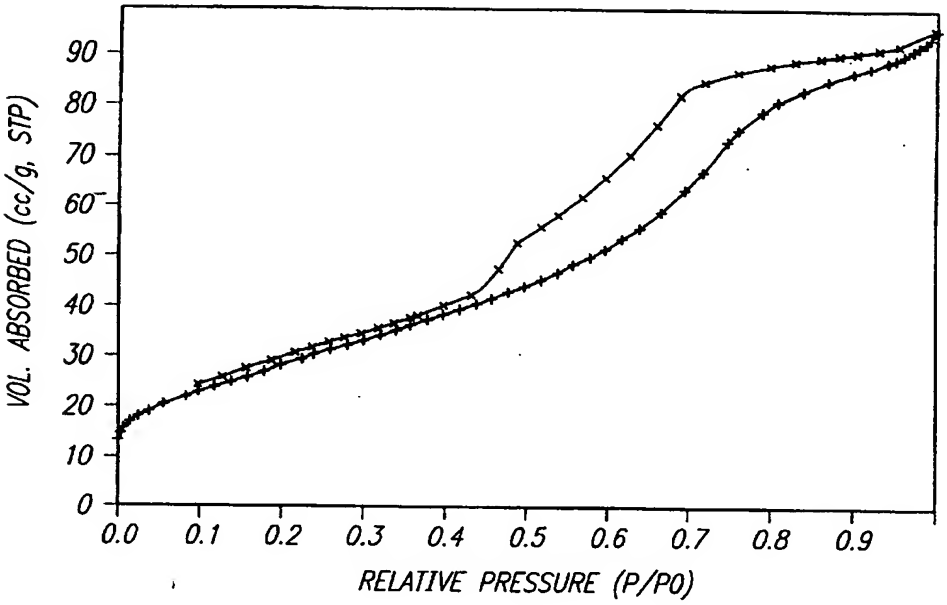


FIG. 36b

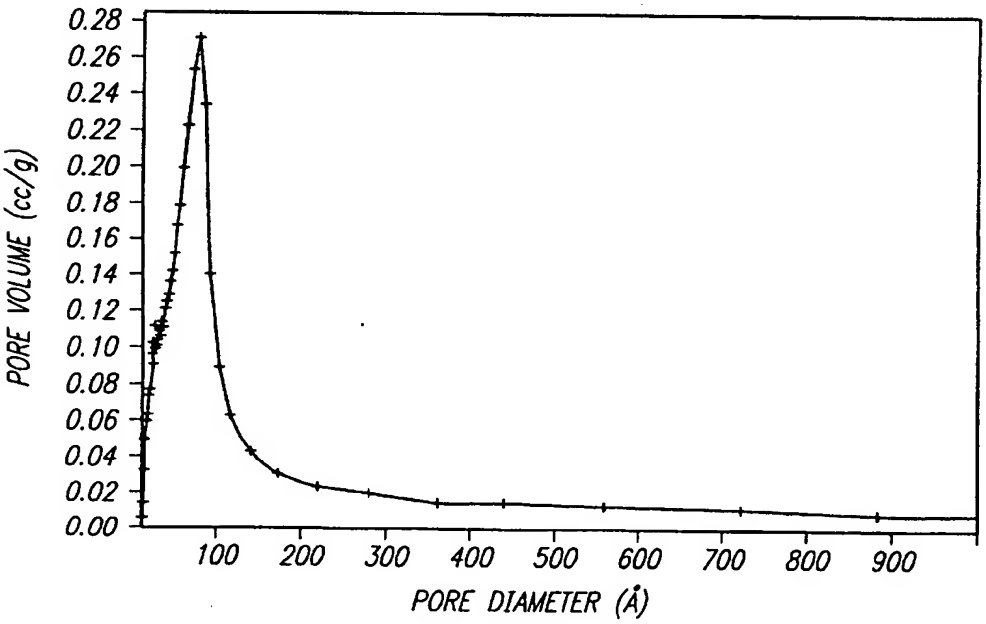
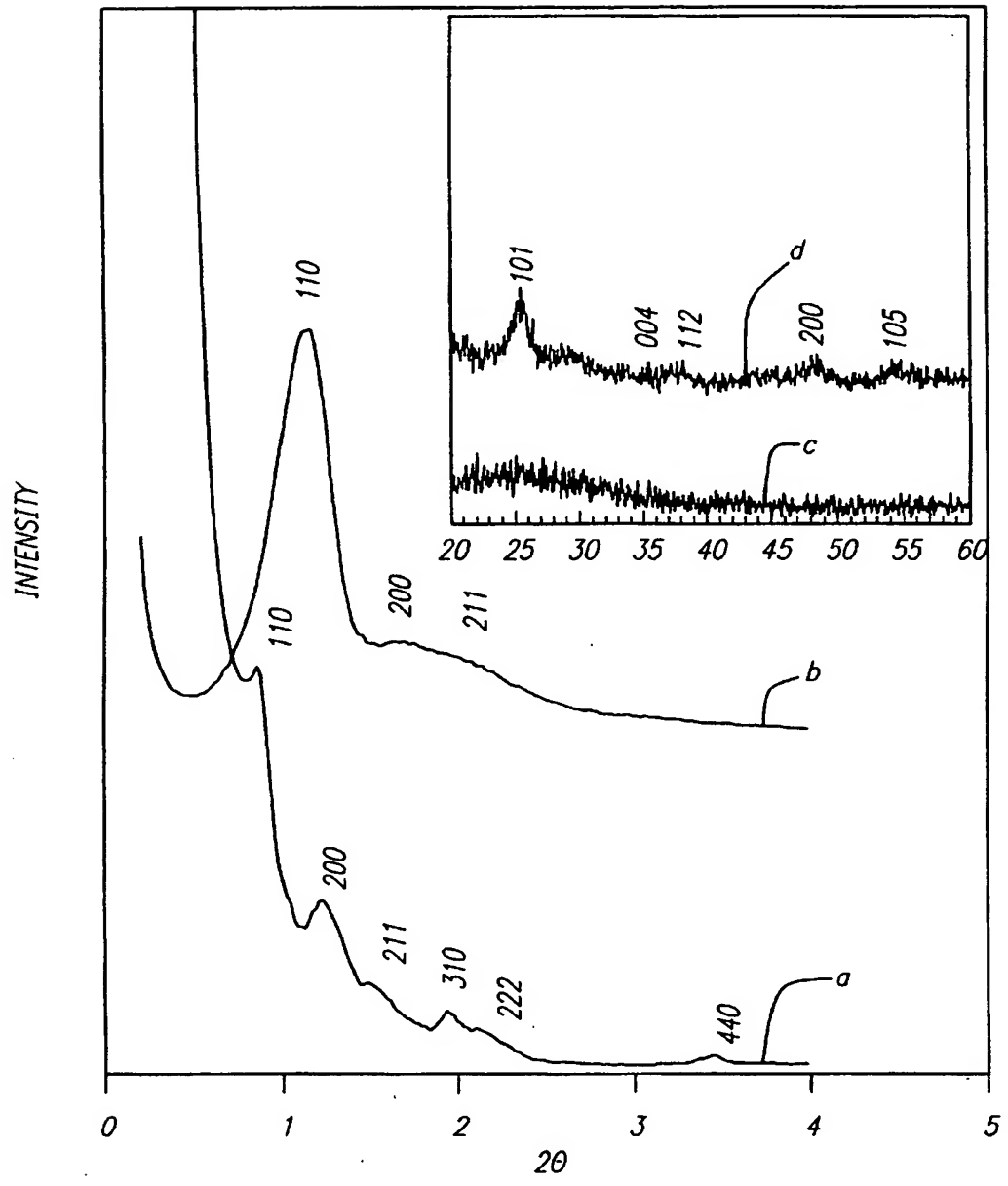


FIG. 37


INTENSITY
2θ
0
1
2
3
4
5
20
25
30
35
40
45
50
55
60
110
110
200
211
200
211
310
222
440
101
004
112
200
105
a
b
c
d

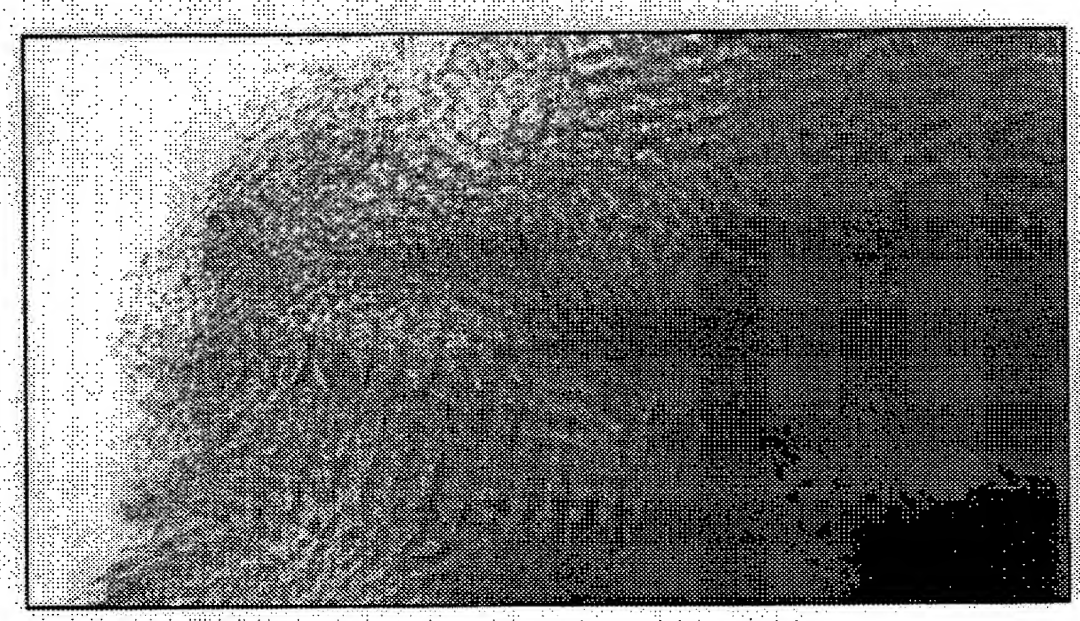


FIG. 38

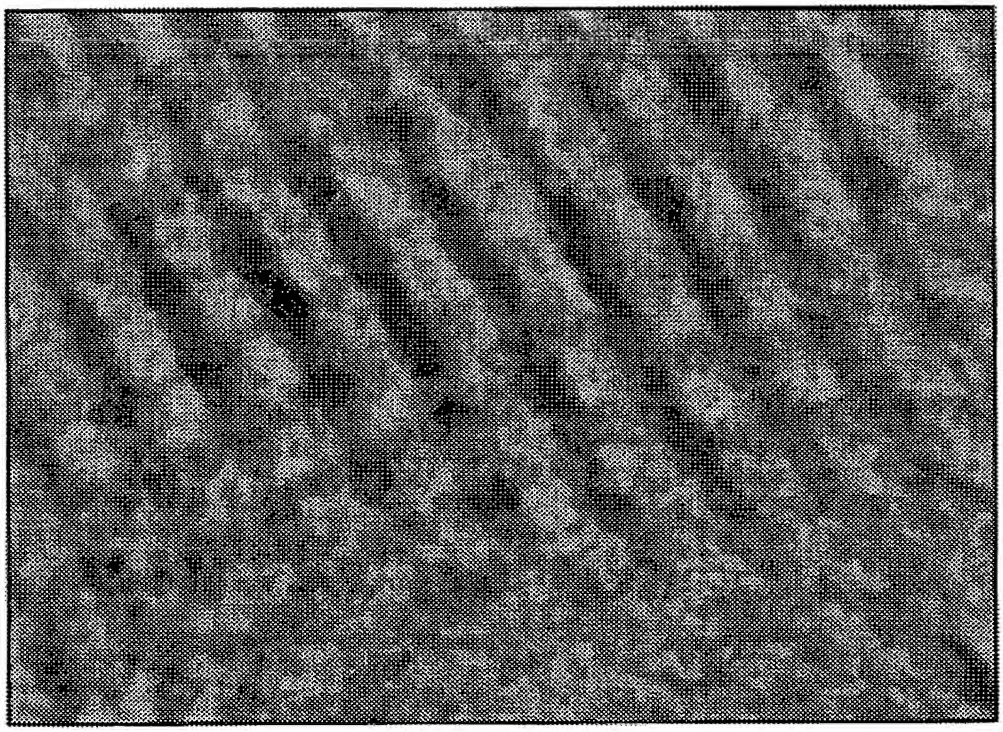


FIG. 39

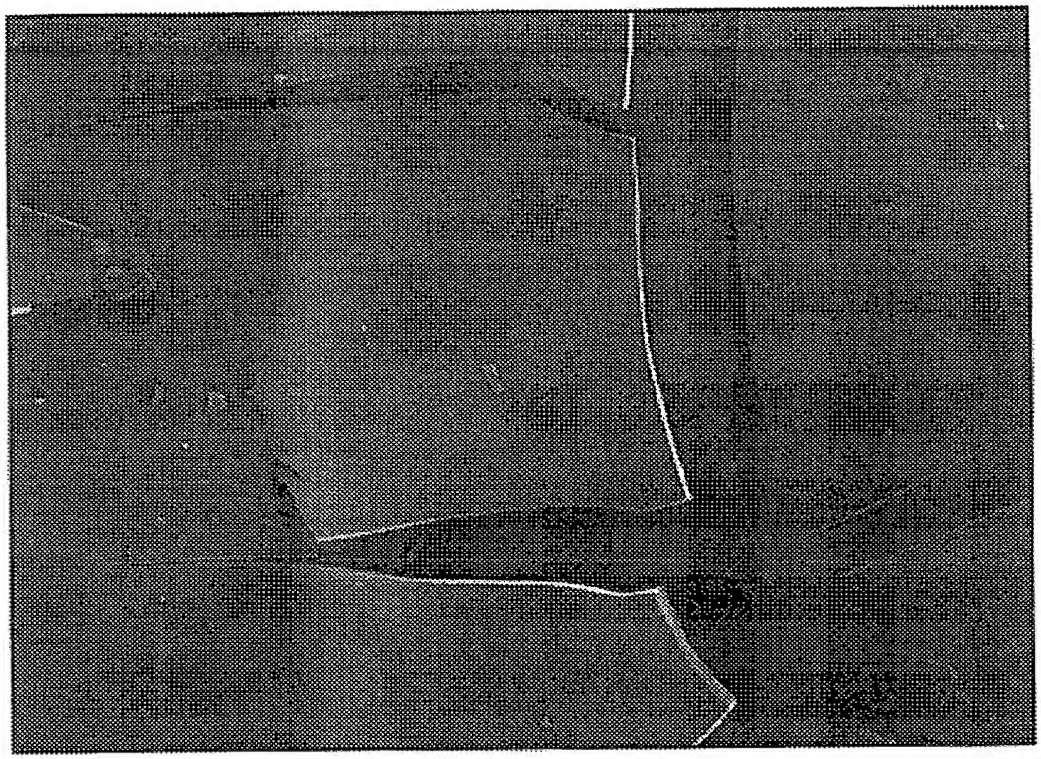


FIG. 40

10 μm

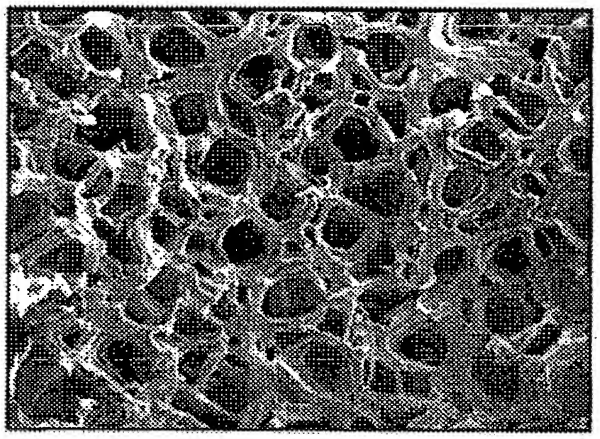


FIG. 41a

10 μm
0 kV X 3,000 12mm

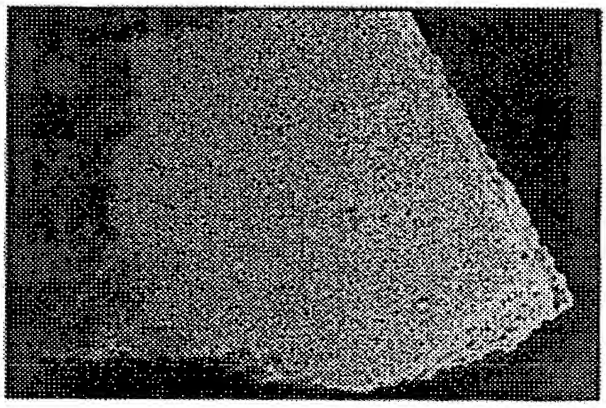


FIG. 41b

0.1 mm

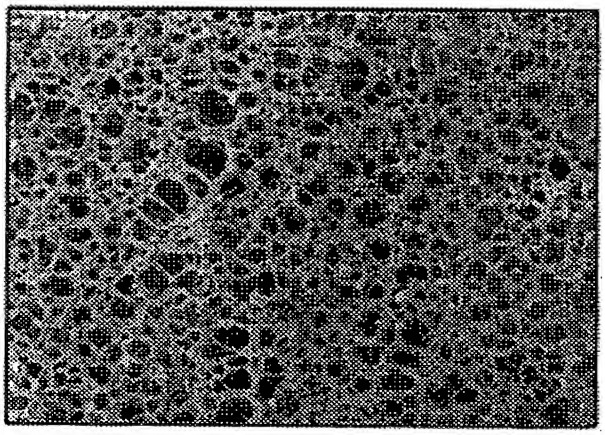


FIG. 41c

1 nm

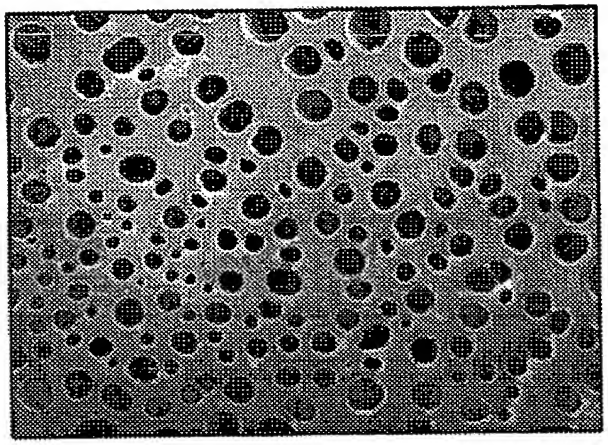


FIG. 41d

10 μm

3.0 kV x 1.300 10mm

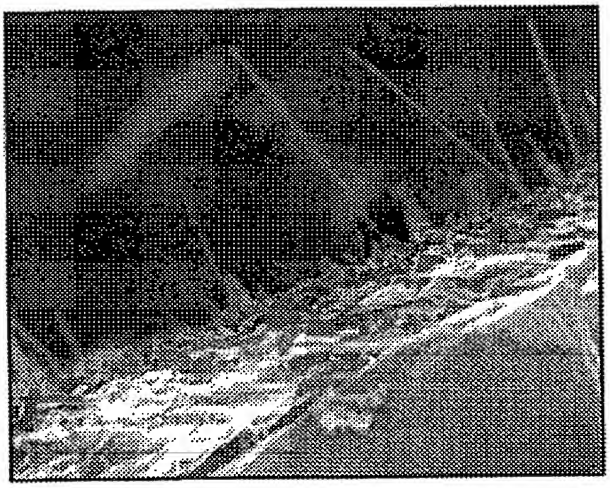


FIG. 41e

10 μm

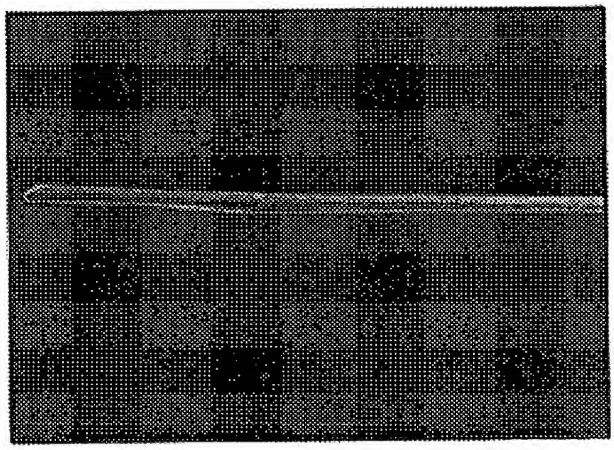


FIG. 41f

1 μm

3.0 kV x 5.500 11mm

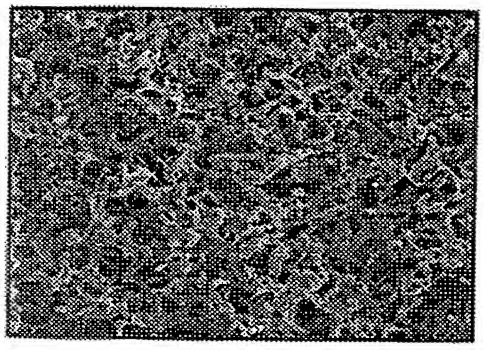


FIG. 42a

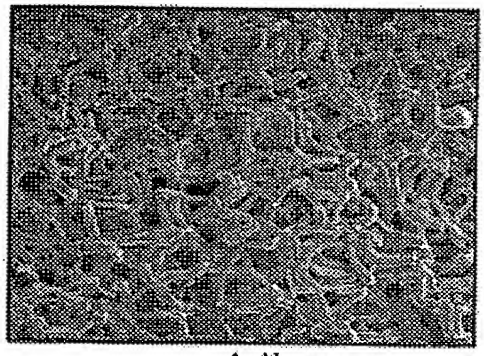


FIG. 42b

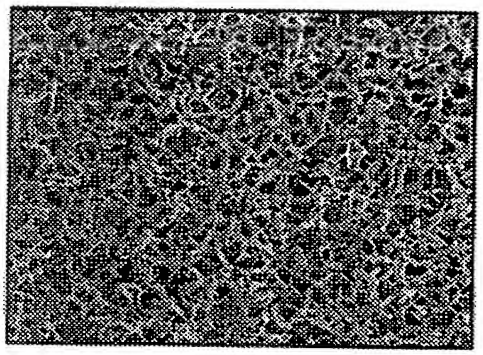


FIG. 42c

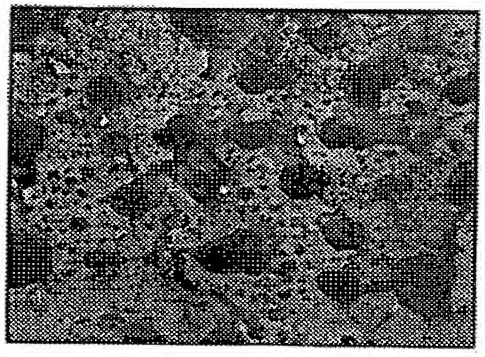


FIG. 42d

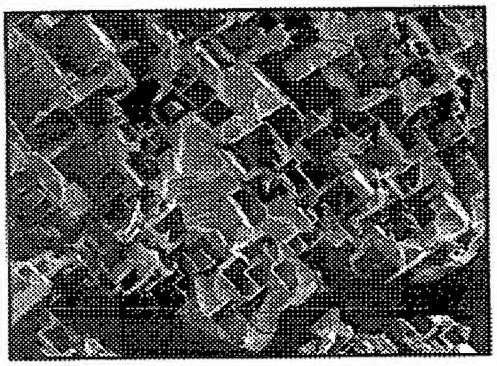


FIG. 43a

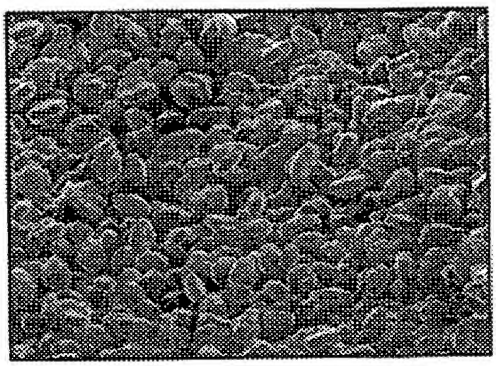


FIG. 43b

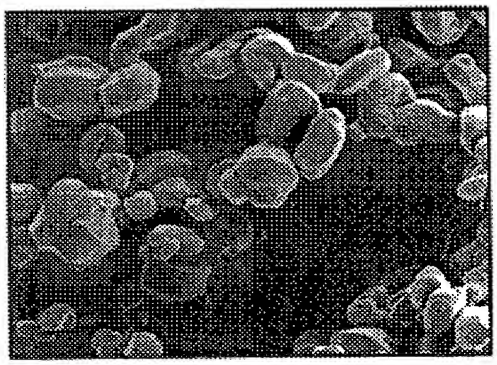


FIG. 43c

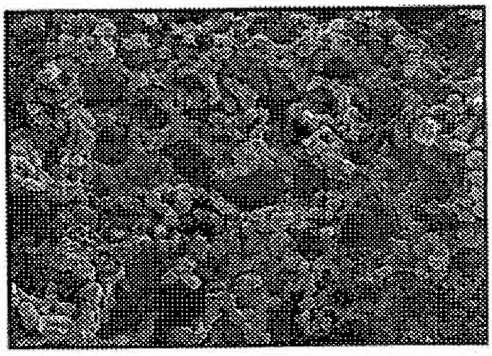


FIG. 43d

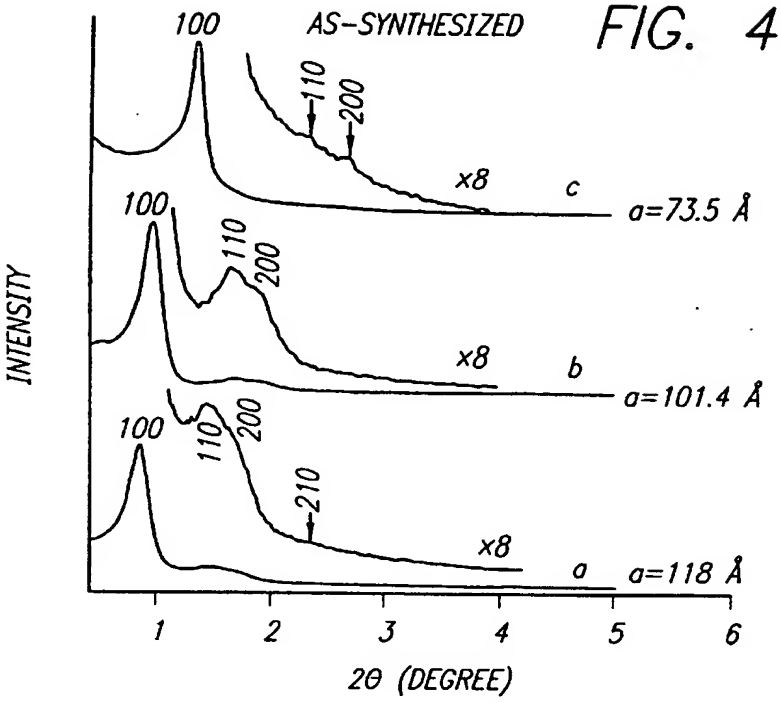


FIG. 44a

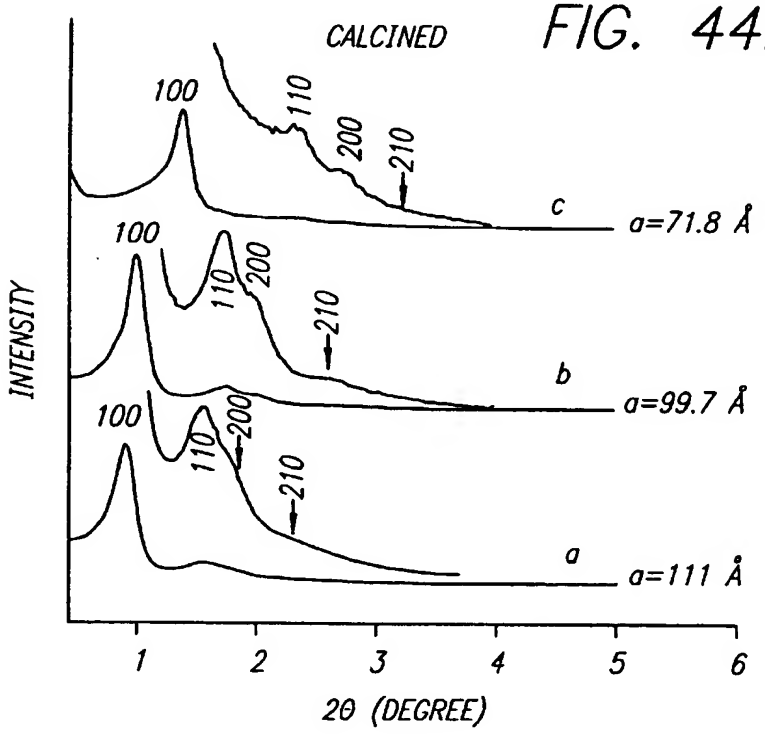


FIG. 44b

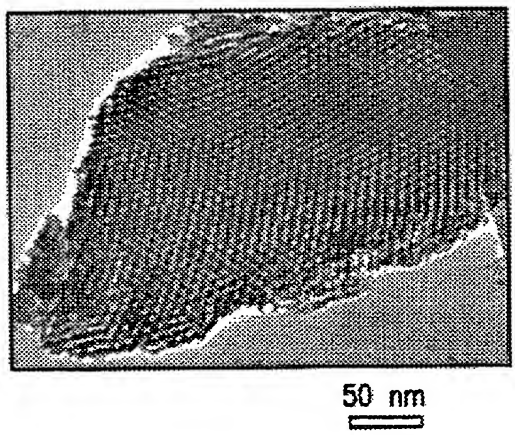


FIG. 45a

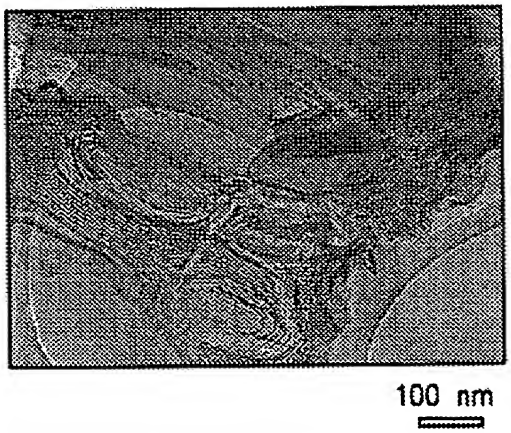


FIG. 45b

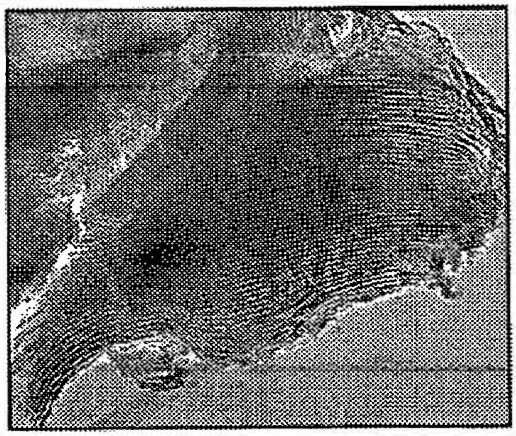


FIG. 45c

FIG. 45d

FIG. 46a

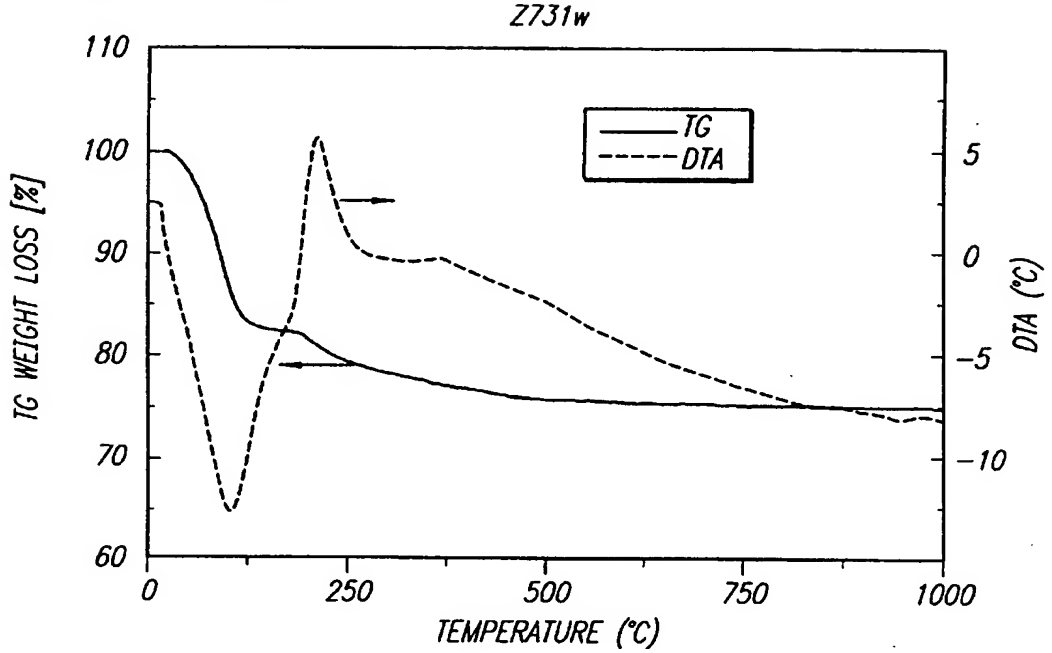


FIG. 46b

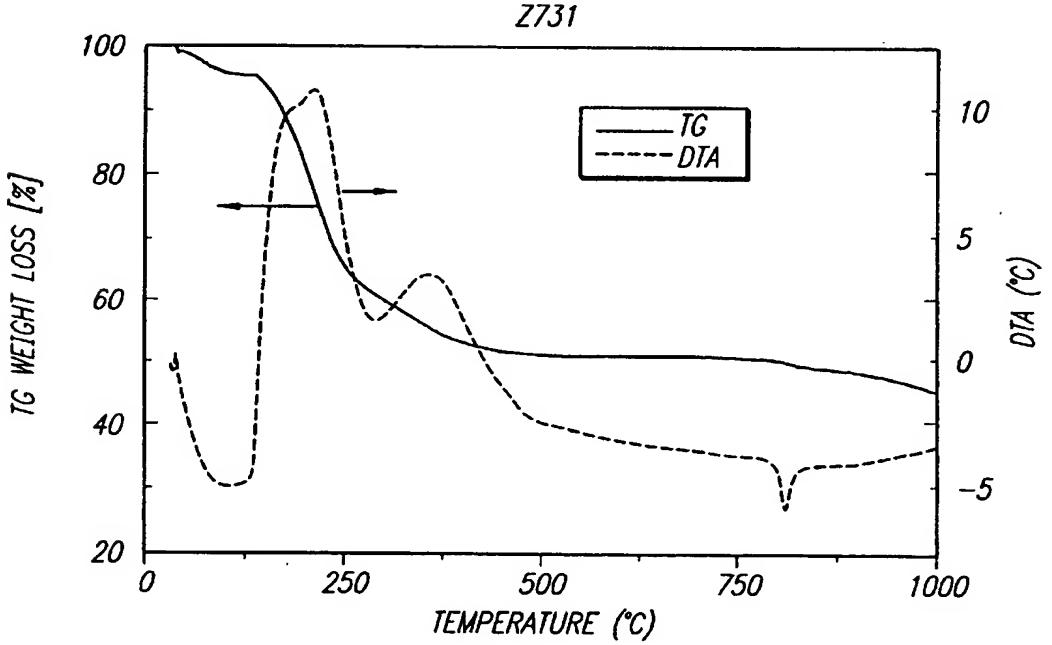


FIG. 47a

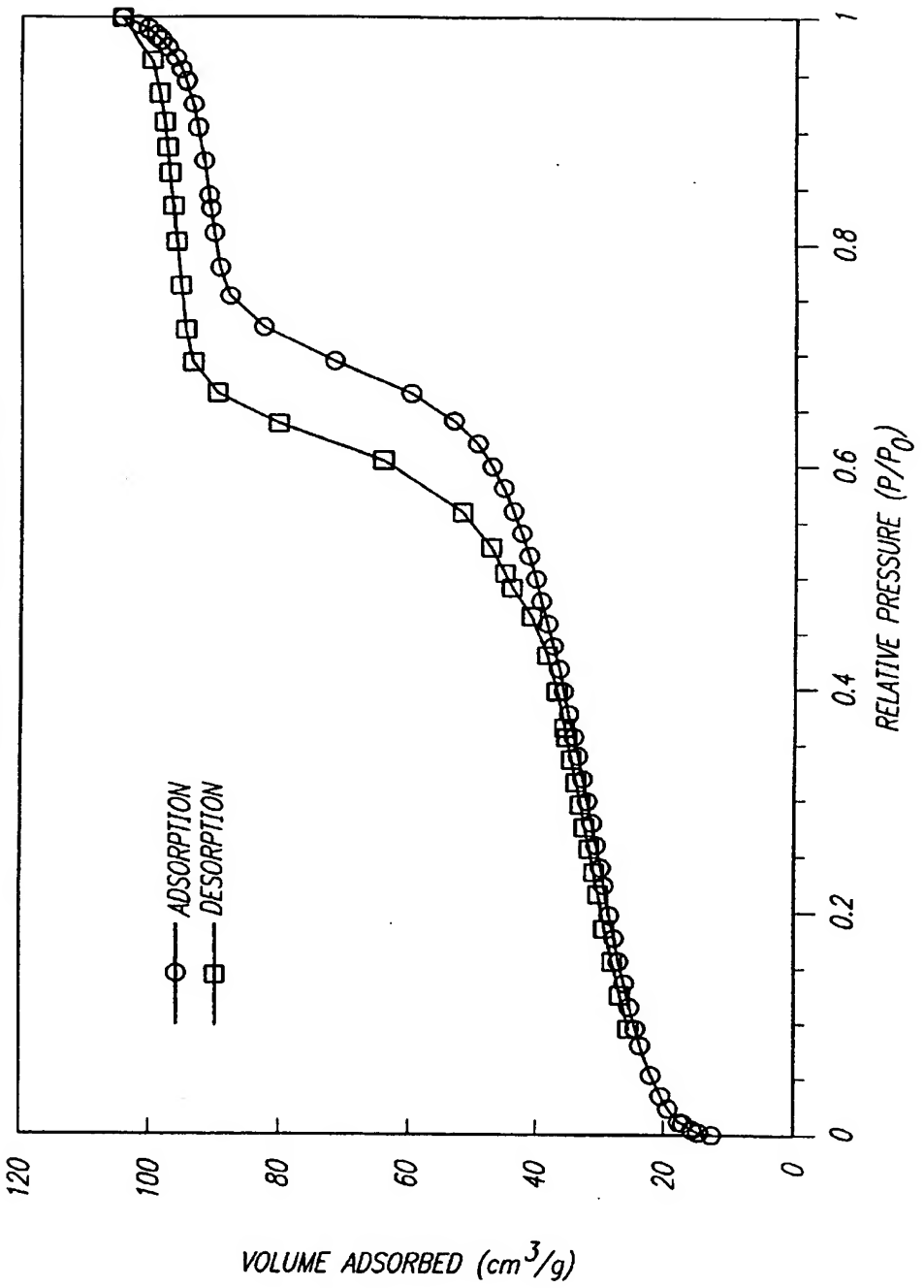

ZHAO.061 10:12:48 AM 8/11/98
ADSORPTION
DESORPTION
VOLUME ADSORBED (cm3/g)
120
100
80
60
40
20
0
RELATIVE PRESSURE (P/P0)
0
0.2
0.4
0.6
0.8
1

FIG. 47b

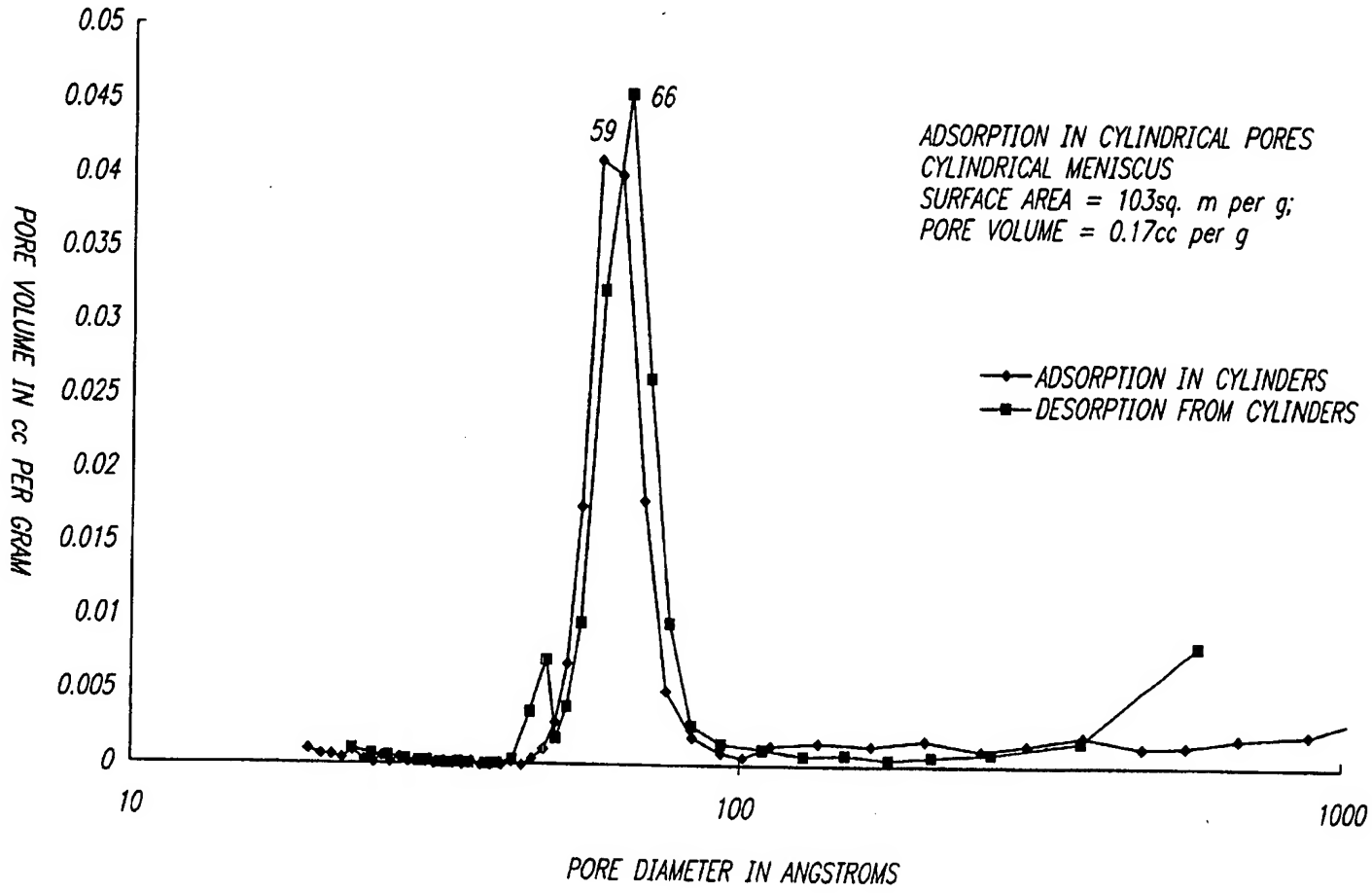

PLOT FOR ADSORPTION IN CYLINDERS
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
PORE VOLUME IN cc PER GRAM
59
66
ADSORPTION IN CYLINDRICAL PORES
CYLINDRICAL MENISCUS
SURFACE AREA = 103sq. m per g;
PORE VOLUME = 0.17cc per g
ADSORPTION IN CYLINDERS
DESORPTION FROM CYLINDERS
10
100
1000
PORE DIAMETER IN ANGSTROMS

FIG. 48a

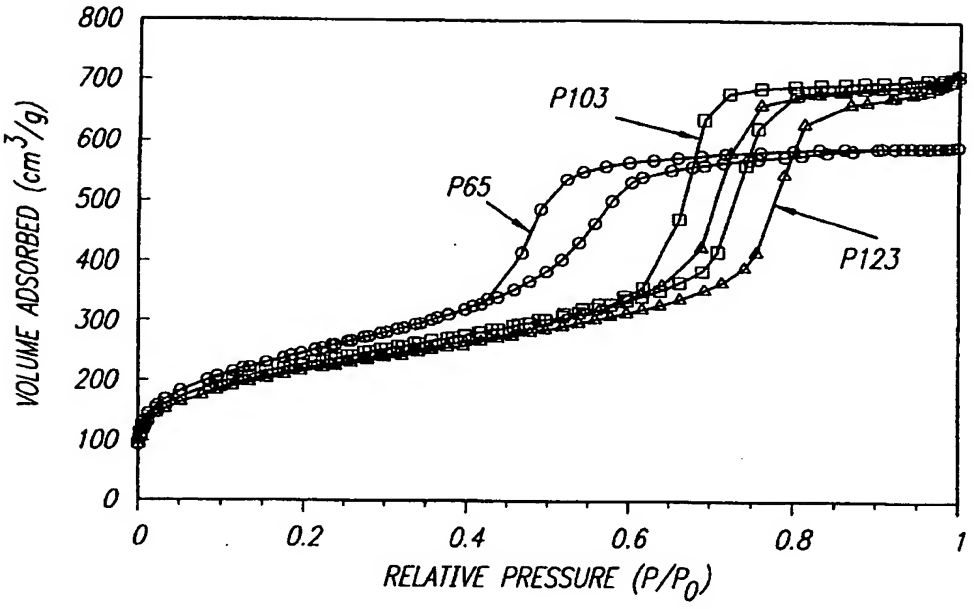


FIG. 48b

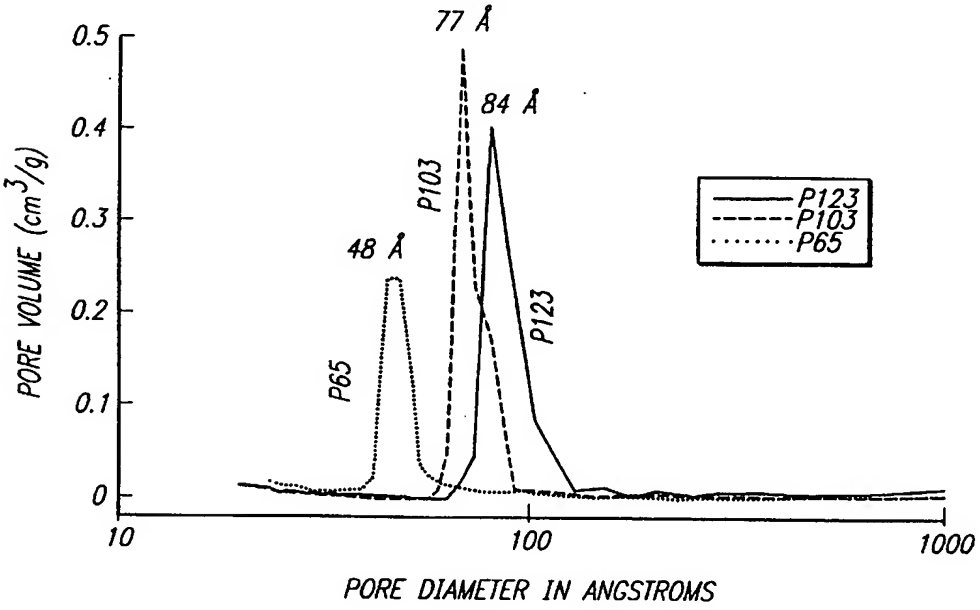


FIG. 49a

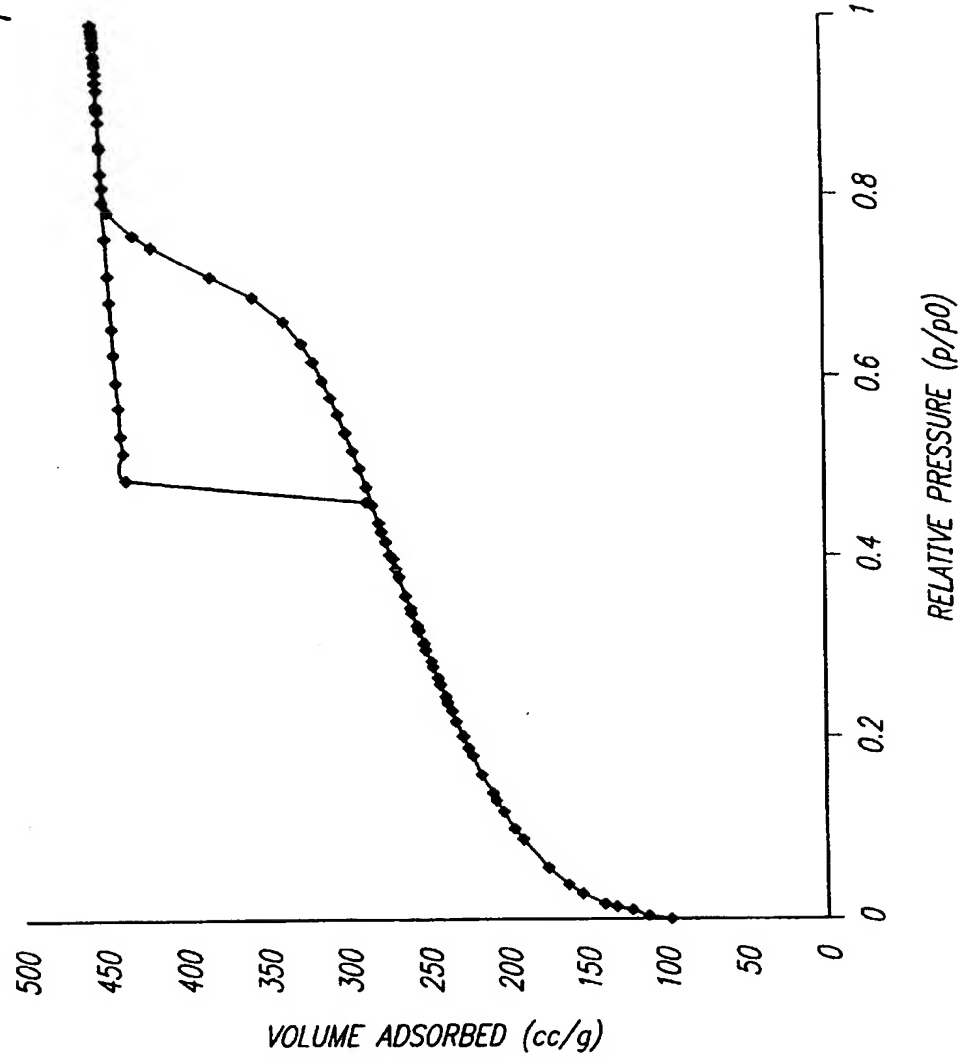

500
450
400
350
300
250
200
150
100
50
0
VOLUME ADSORBED (cc/g)
0
0.2
0.4
0.6
0.8
1
RELATIVE PRESSURE (p/p0)

FIG. 49b

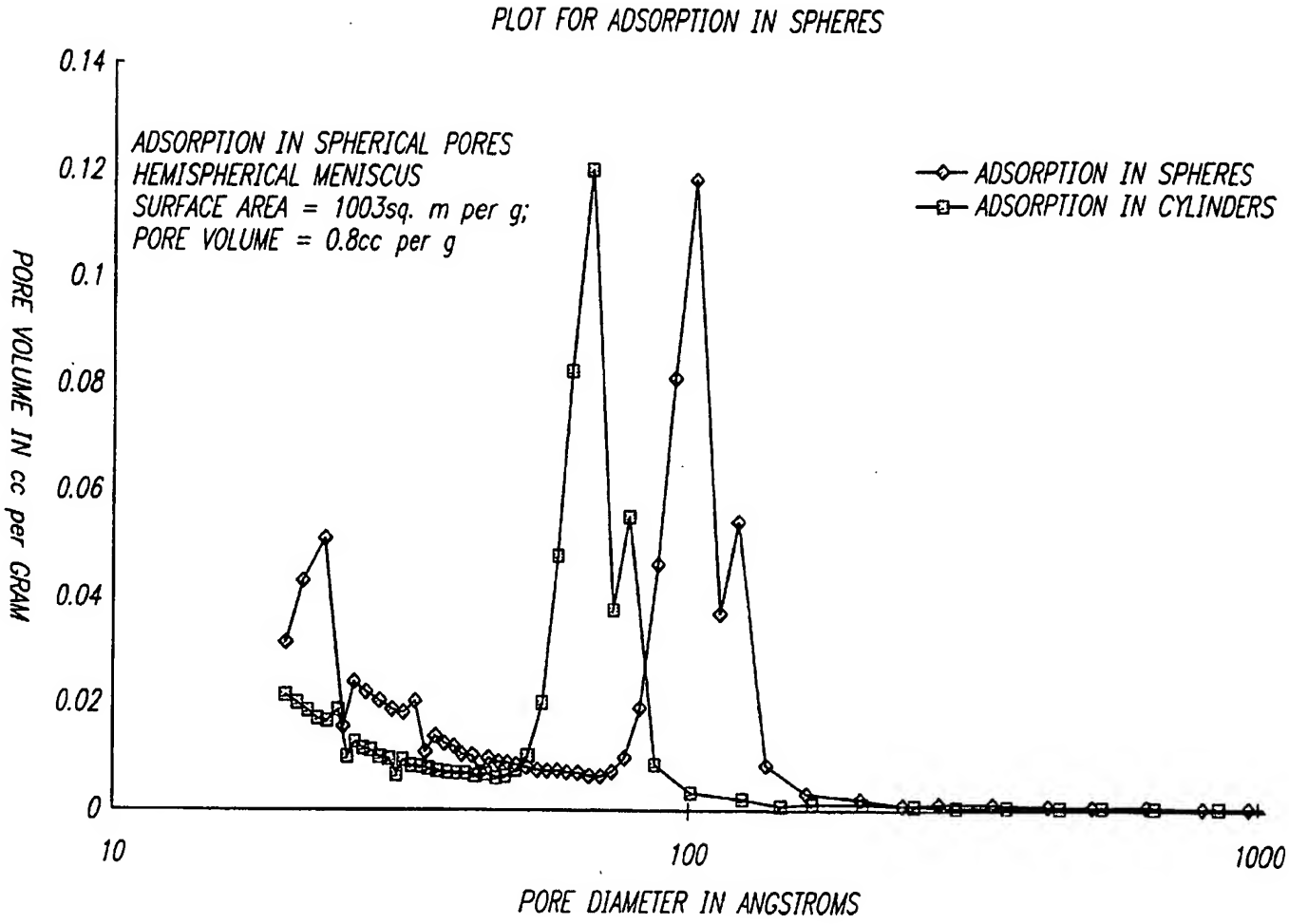

PLOT FOR ADSORPTION IN SPHERES
ADSORPTION IN SPHERICAL PORES
HEMISPHERICAL MENISCUS
SURFACE AREA = 1003sq. m per g;
PORE VOLUME = 0.8cc per g
ADSORPTION IN SPHERES
ADSORPTION IN CYLINDERS
PORE VOLUME IN cc per GRAM
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
10
100
1000
PORE DIAMETER IN ANGSTROMS

FIG. 50a

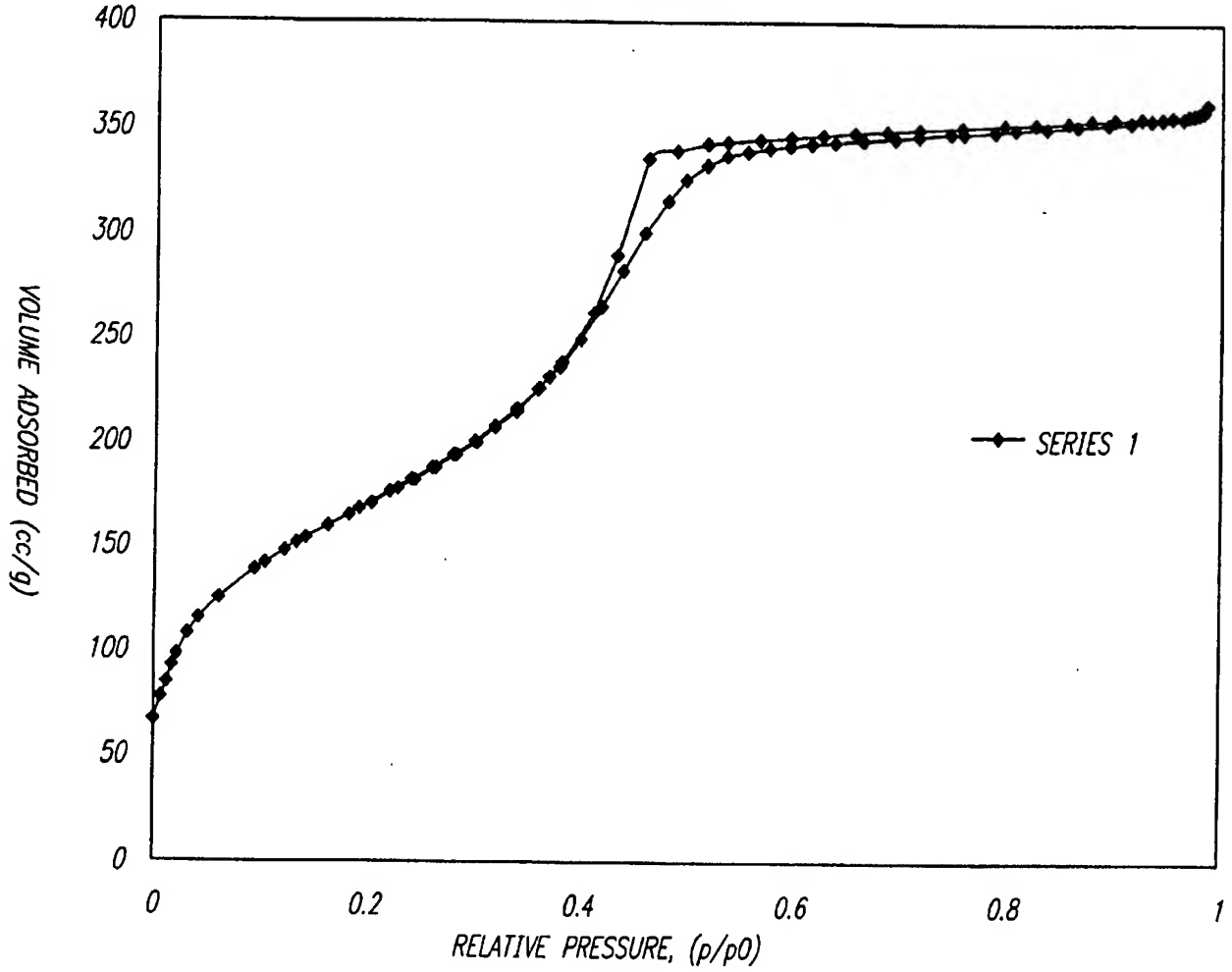
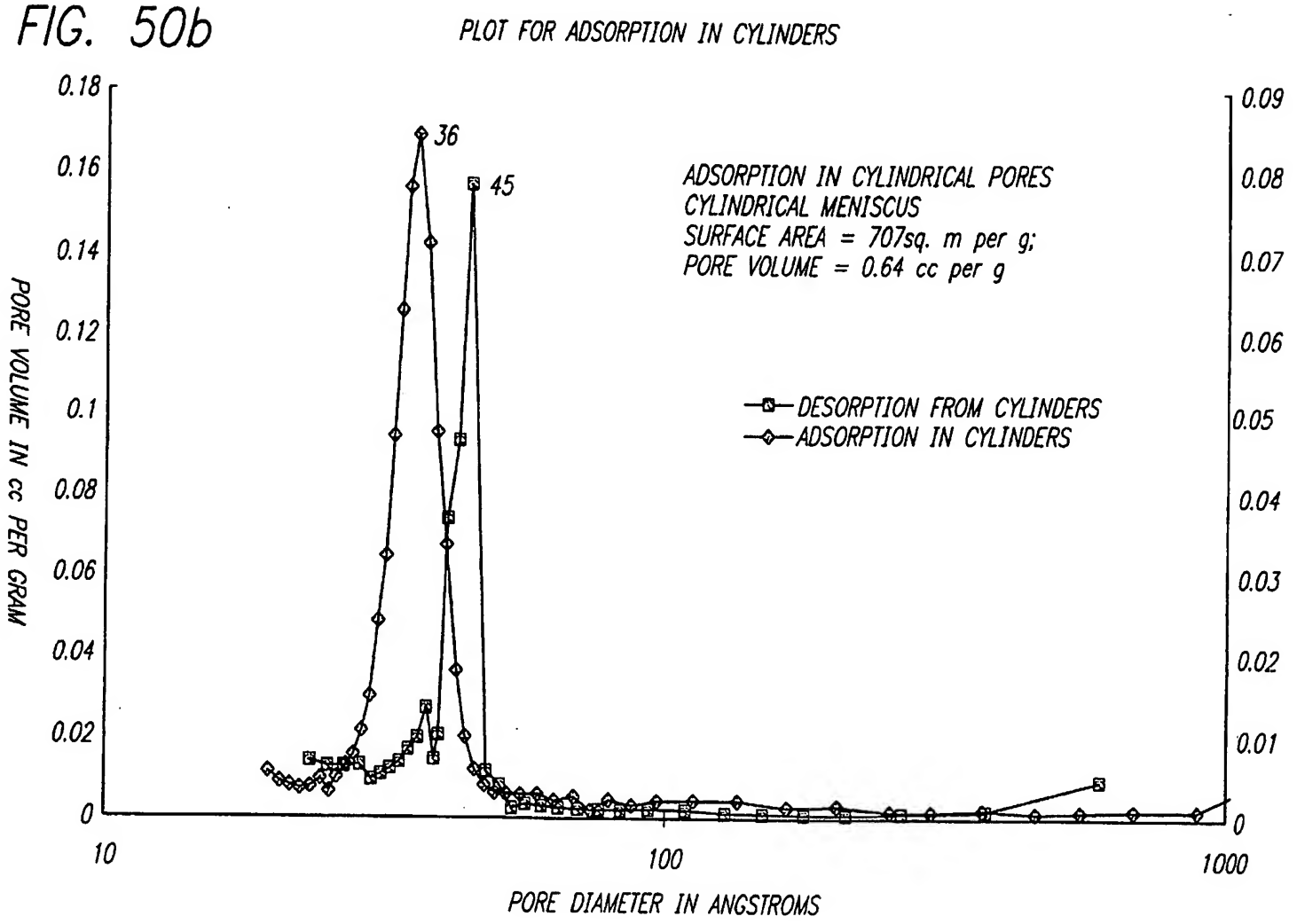

400
350
300
250
200
150
100
50
0
VOLUME ADSORBED (cc/g)
0
0.2
0.4
0.6
0.8
1
RELATIVE PRESSURE, (p/p0)
SERIES 1

FIG. 50b


PLOT FOR ADSORPTION IN CYLINDERS
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
36
45
ADSORPTION IN CYLINDRICAL PORES
CYLINDRICAL MENISCUS
SURFACE AREA = 707sq. m per g;
PORE VOLUME = 0.64 cc per g
DESORPTION FROM CYLINDERS
ADSORPTION IN CYLINDERS
PORE VOLUME IN cc PER GRAM
10
100
1000
PORE DIAMETER IN ANGSTROMS

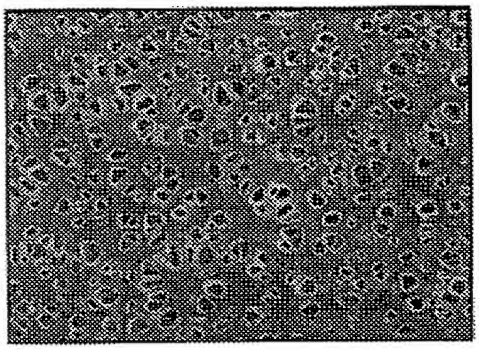


FIG. 51a

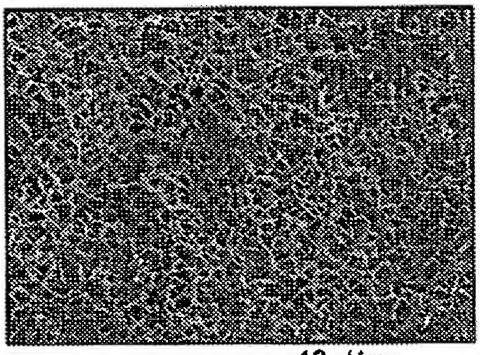


FIG. 51b

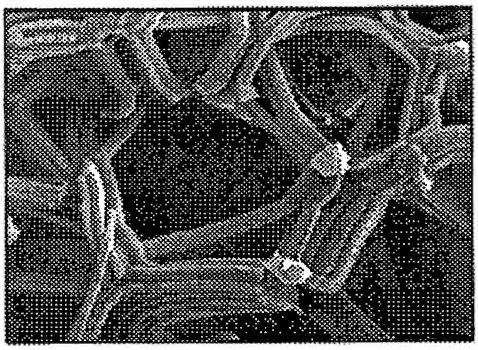


FIG. 51c

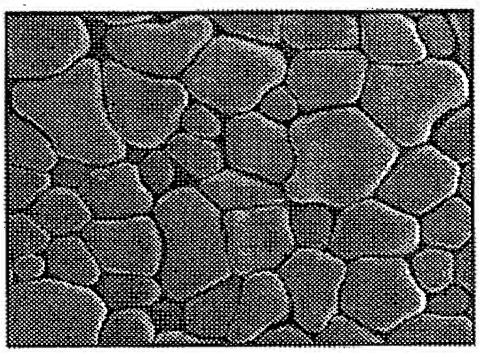


FIG. 51d

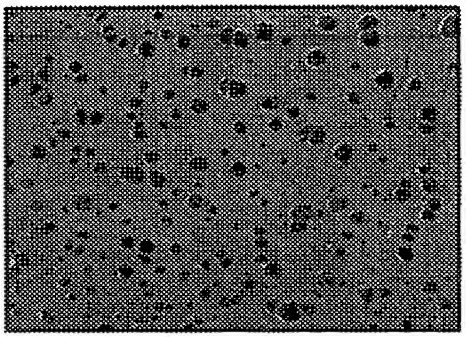


FIG. 51e

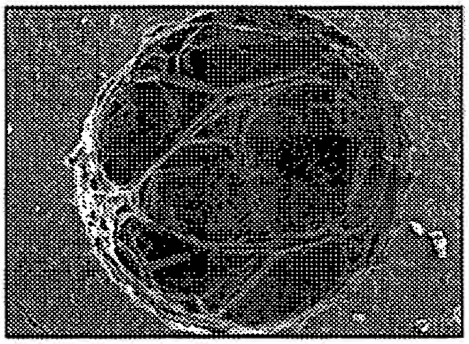


FIG. 51f

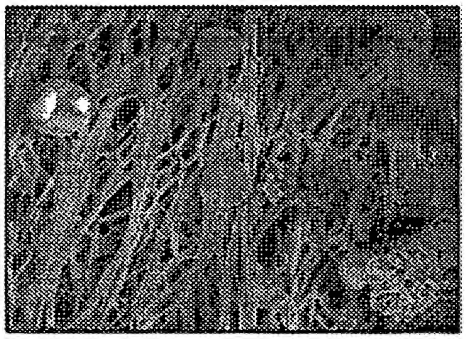


FIG. 51g

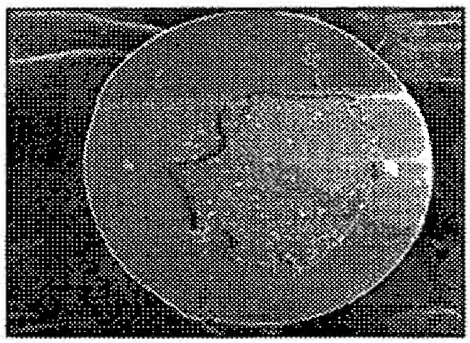


FIG. 51h

FIG. 52

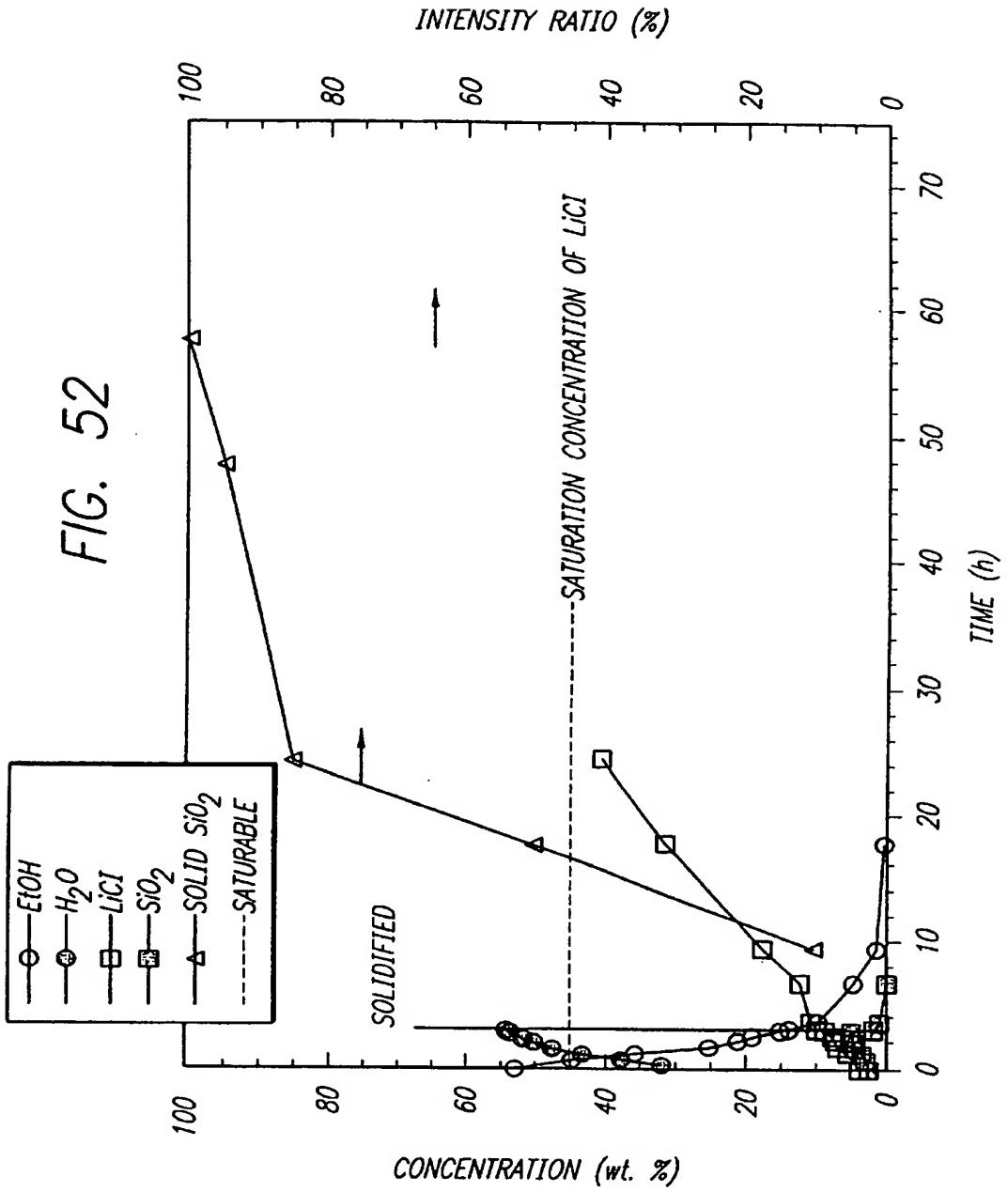

INTENSITY RATIO (%)
100
80
60
40
20
0
SATURATION CONCENTRATION OF LiCl
SOLIDIFIED
EtOH
H_2O
LiCl
SiO_2
SOLID SiO_2
SATURABLE
TIME (h)
0
10
20
30
40
50
60
70
CONCENTRATION (wt. %)

FIG. 53

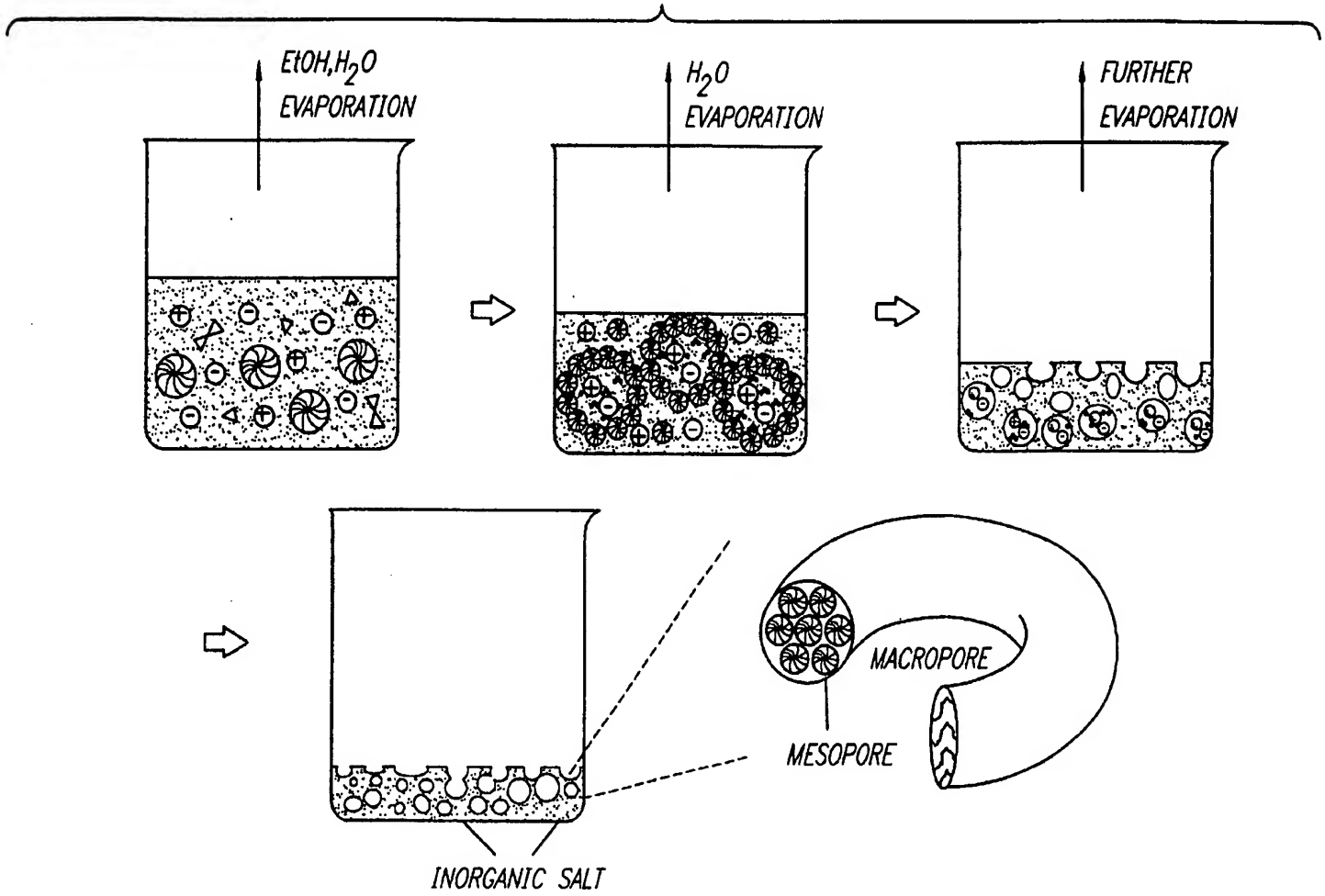

EtOH, H_2O
EVAPORATION
H_2O
EVAPORATION
FURTHER
EVAPORATION
MACROPORE
MESOPORE
INORGANIC SALT

FIG. 54a

0.1 mm

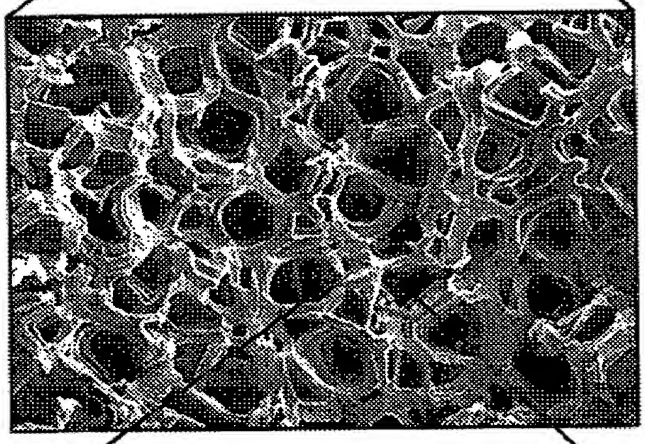


FIG. 54b

10 μm

3.0 kV X 3.000 12mm

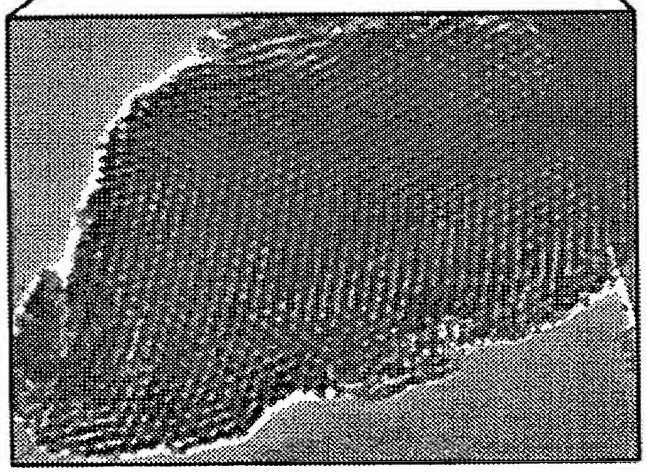
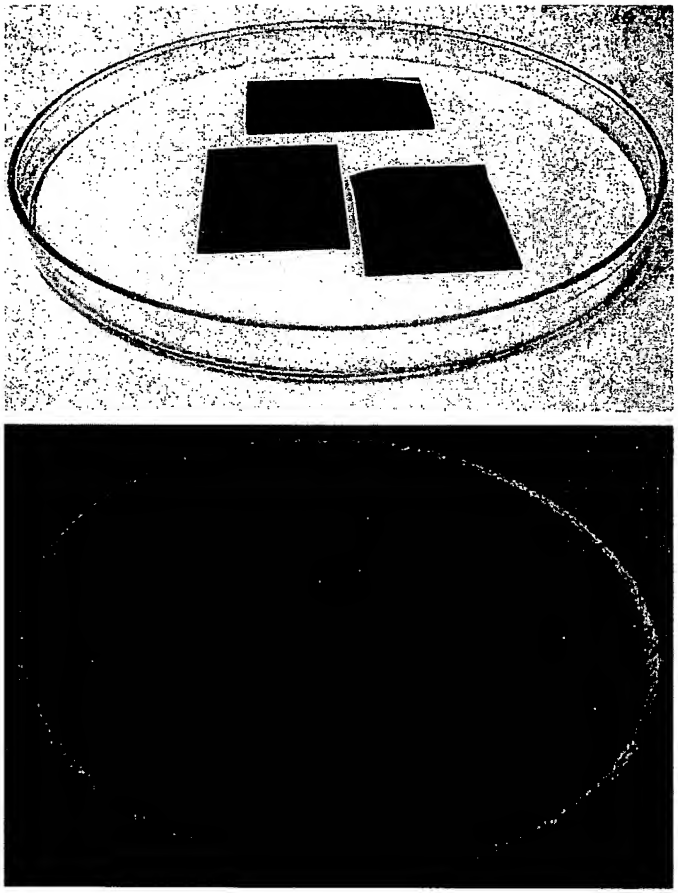


FIG. 54c

50 nm



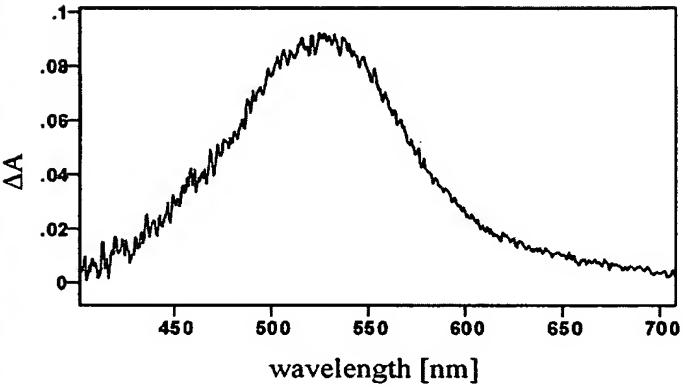


Figure 55. Mesostructured 1 μm thick, silica/$EO_{106}PO_{70}EO_{106}$ optical films under ambient and longwave irradiation. The absorption difference spectrum is for the spiropyran dye (1',3'-Dihydro-1',3',3'-trimethyl-6-nitrospiro[2*H*-1-benzopyran-2,2'-2(*H*)-indole]) employed here and excited under near-UV light (365 nm).

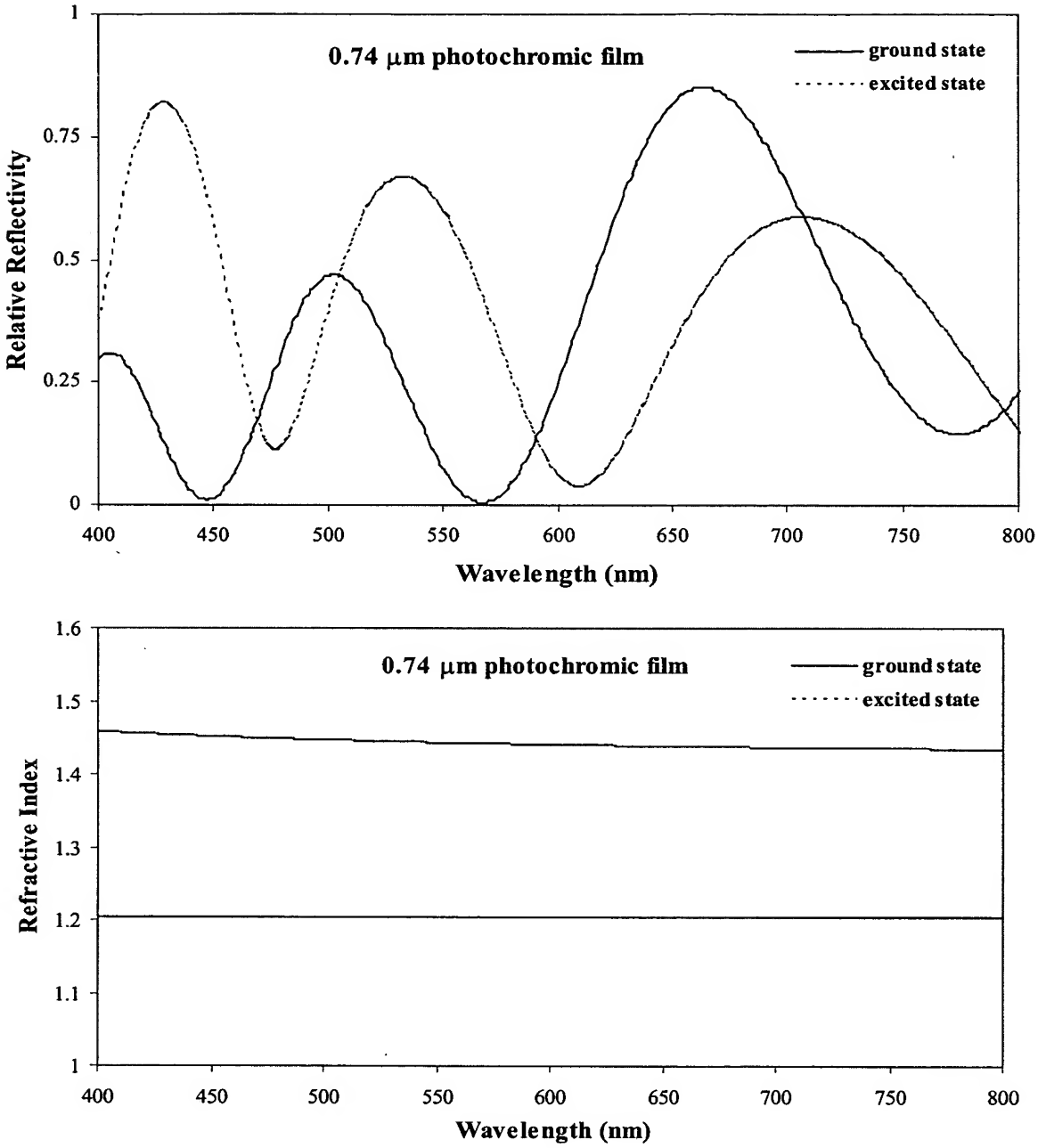
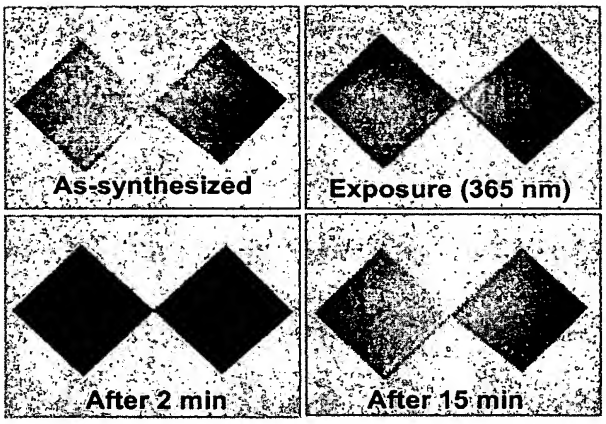
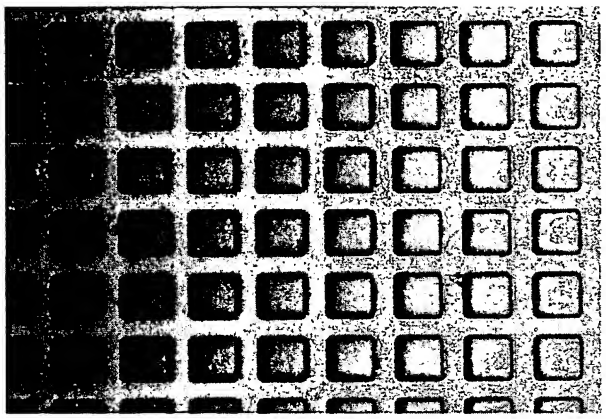


Figure 56. Examples of the observed reflectance spectra and the calculated refractive indices for the mesostructured silica/$EO_{106}PO_{70}EO_{106}$ optical film containing the spiropyran dye in the ground state (blue, solid trace) and the excited state (red, dashed trace).





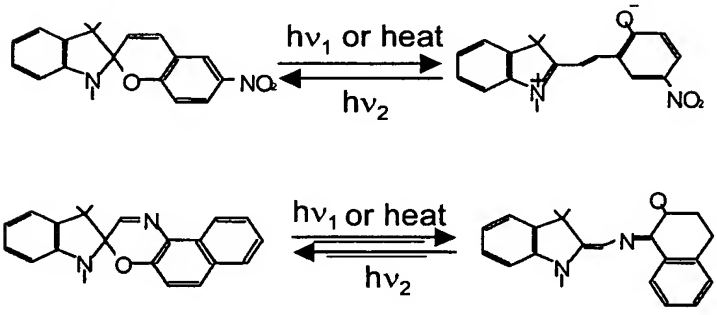


Figure 57. Different dynamic responses of patterned films of 55 wt% $EO_{106}PO_{70}EO_{106}$-silica composites containing different spiropyran or spiroxazine dye species are shown upon exposure to incident ultraviolet light. Different dye-composite compositions and processing conditions will be explored by using high-throughput synthesis and screening methods, specifically robotic ink-jet printing to deposit systematically varying arrays.